

Infrastructure as a Service: An Operational Model for Accelerating New Service Delivery

Cisco Infrastructure as a Service

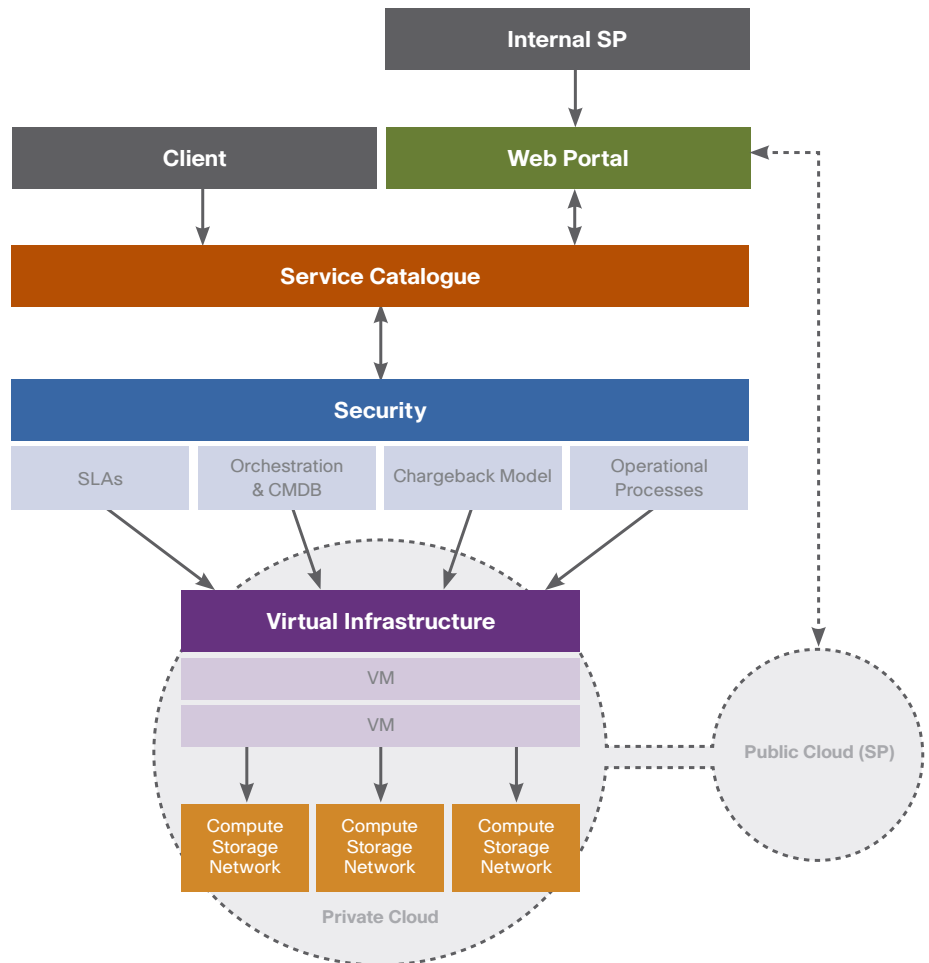
Service providers face a strong business imperative to gain increased revenue from the data center. Infrastructure as a service (IaaS), a cloud service where enterprise customers utilize pay-as-you-go infrastructure from a service provider, will provide a major new revenue stream and an opportunity to move up the value chain.

IaaS offers a new operational model for accelerated delivery of the new IT high-value services. IaaS delivers, for example, the ability to transform the economics of disaster recovery solutions and enables significant cost savings by consolidating underutilized IT software development and test compute resources into a virtualized environment made flexible with rapid provisioning capability. These have the potential to revolutionize the manner in which businesses consume IT services and make it feasible for service providers to deliver services once only feasible in the enterprise using costly in-house solutions. Cisco® IaaS enables these benefits for service providers with the fusion of virtualized data center resources, unified fabric, and the communication capabilities of an IP next-generation network (IP NGN).

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Figure 1. Architecture Overview



Cisco offers a holistic IaaS-enabling architecture that builds on a unified service delivery (USD) platform and offers the fast track to IaaS, giving service providers the potential to accelerate time to increased revenue, deliver higher margin services, and address the need for trusted end-to-end offerings. Based upon new technologies that can deliver radical data center consolidation and architecture simplification, coupled with rapid orchestration and provisioning capabilities, Cisco IaaS architectures are now technically and operationally feasible, with rapid deployment based on proven implementation processes.

IaaS provides the foundation technologies to enable and accelerate USD while minimizing additional investment. Although service providers might be at different stages of offering services based on data center evolution, they can use Cisco expertise to reduce risk and accelerate the time to revenue of highly virtualized, secure, and automated IaaS offerings.

It is essential to take a strategic architectural approach to IaaS to achieve operational and business benefits, balancing significant tradeoffs that include competitive advantage, operational change, capex/opex investments, new or evolved technical and business architectures, and business risk.

Cisco can provide the expertise through a range of professional IaaS enablement services to support evaluation of the appropriate IaaS strategy, architecture, and orchestration planning, design, and implementation to realize an IaaS operational model. This expertise is based upon extensive inside track experience of designing complex data centers across multiple technology areas that underpin IaaS architectures.

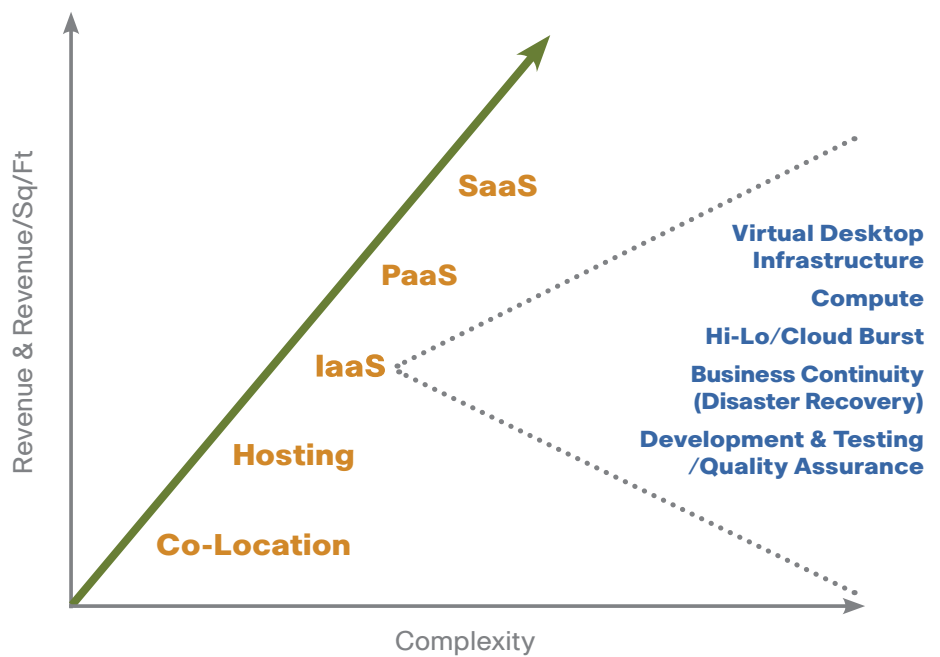
Service Provider Challenges

Worldwide, service providers face common challenges:

- Low and declining margins on hosted, co-location, and similar services
- Increasing operating expenses
- Need to support growth while addressing cost pressures
- Complexity in existing data center setups
- Inability to quickly provision new services to customers.

Traditional data center services such as co-location and hosting are low-complexity, low-revenue services. Offering IaaS and associated cloud services has the potential to generate higher revenues per square foot. To achieve this, service providers must evolve the data center to a model based on delivering software as a service, platform as a service, and infrastructure as a service (SPI), the three main categories of cloud computing.

Figure 2. Service Providers Move Up the Value Chain
Evolution of SP Services: SPI Model



According to IDC, there will be a global transformation in how services are delivered. IDC believes that simplifying the data center is an important step in improving the ability to deliver new services in a rapid and cost-effective manner. Information technology is becoming a service, open to new business opportunities, and becoming network centric instead of device centric (source: IDC: Transforming the Service Delivery Model, 2009).

To take advantage of these opportunities, service providers must eliminate duplication of resources, operations, and infrastructure that will hinder their ability to support simplified, cost-effective service delivery. Implementing IaaS will eliminate that duplication by enabling service providers to build multiple services on the same infrastructure. Implementation will also require changes in virtualization, multitenancy security and performance, scale, resilience, architecture, system integration, vendor selection, workflows, load balancing, security, and documentation. Those elements have to be built, integrated, and provisioned: any problems can delay time to market and revenue.

This presents significant operational challenges:

- Offer new capabilities
- Increase service and feature velocity
- Optimize capex and opex
- Compute and justify ROI
- Secure the user experience
- Manage a multitenant infrastructure
- Align and optimize internal processes
- Define and deliver SLAs
- Implement usage-based, per-customer costing.

IaaS enabled by Cisco technology can help service providers address these challenges by:

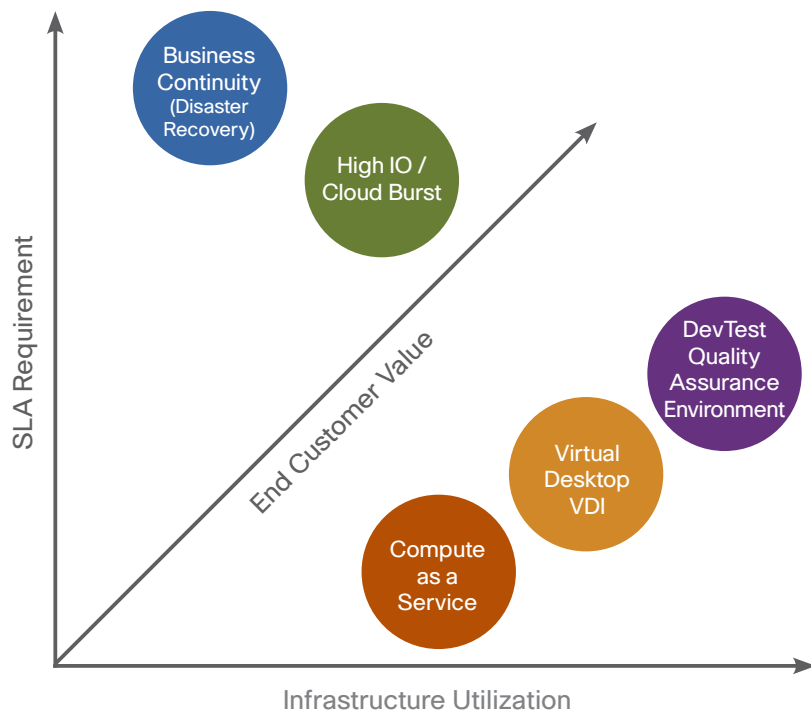
- Providing the foundation technologies for higher-value IT service offerings
- Capitalizing on IP NGN and data center assets
- Using scale and multitenancy capability
- Amortizing infrastructure across multiple customers
- Significantly cutting power, cooling, and management costs compared to traditional data center designs
- Helping service providers offer effective solutions that provide new revenue opportunities.

IaaS Customer Offer

IaaS, one of the three main categories of cloud computing services, is a provision model in which an organization outsources the IT equipment needed to support operations to service providers who typically have many times the enterprise resources. Characteristics and components of IaaS include:

- Utility computing service and billing model
- Automation of administrative tasks
- Dynamic scaling
- Desktop virtualization
- Policy-based services
- Internet connectivity.

Figure 3. Top IaaS Offerings: Relative Advantages



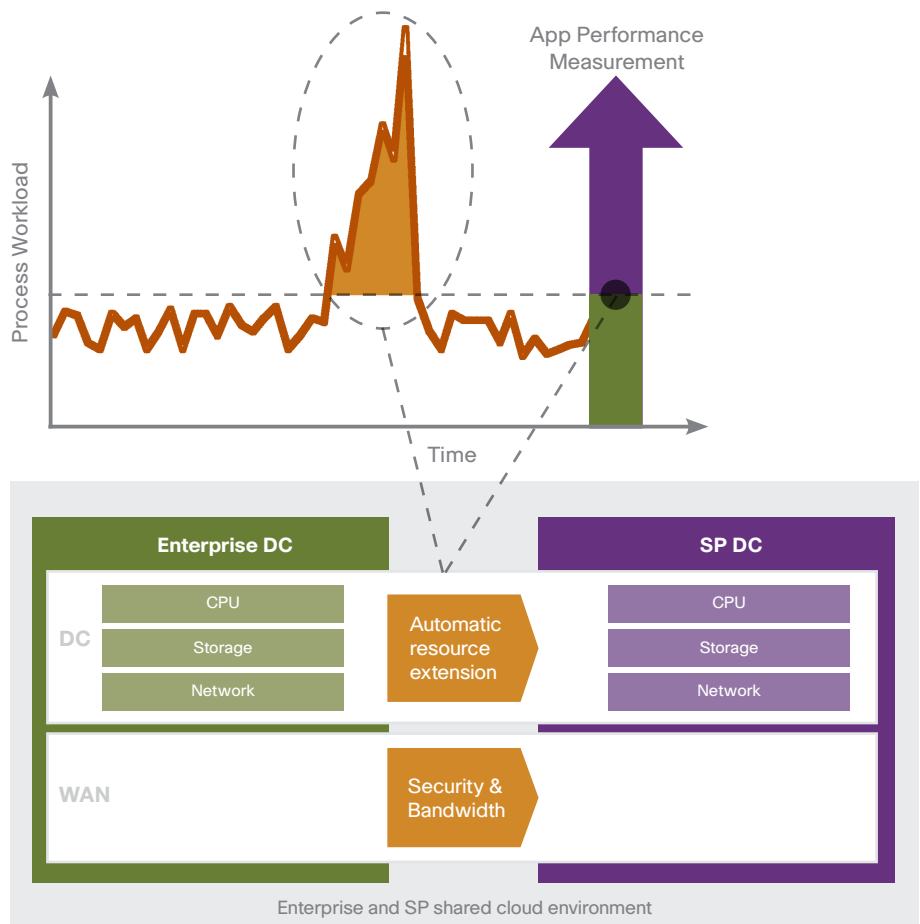
IaaS is a large category and includes services such as:

- Disaster recovery
- Compute as a service
- Storage as a service
- Data center as a service
- Virtual desktop infrastructure
- Hi-IO/cloudburst
- Development/testing environment.

Cisco research indicates that some of these IaaS services offer are already proving attractive to both service providers and enterprise customers, for example:

- **Disaster recovery** represents a low-risk service for the enterprise since they still own primary infrastructure. For the service provider, it offers a high-value service, but with low asset utilization and reduced delivery costs. Provisioning is rapid using orchestration automation.
- **Compute as a service** uses the service provider’s high degree of virtualization to achieve economies of scale and uses tight SLAs and rapid provisioning using orchestration automation to offer “burst” capability to the enterprise.
- **Development/test environment** offers a quick win opportunity for the service provider by using security and SLAs to support enterprise critical development programs. A high degree of virtualization achieves economy of scale and reduces service delivery costs.

Figure 4. Cloud bursting provides peak load capacity for variable processes and automatic deployment of additional resources in the cloud when onsite application performance is low.



There are a number of opportunities for enterprise customers to consider with migration to IaaS. Forrester interviewed organizations that are implementing IaaS. They found that it is best to use cloud platforms as temporary capacity, starting with test and development of new applications, web applications, and high-performance computing. They advise clients to try these application classes first but plan to move on to more advanced uses, such as cloud bursting and using cloud-resident services and management tools, before progressing to cloud-native services (source: Forrester Research: Best Practices: IaaS 2009)

Although an increasing number of enterprises are benefitting from IaaS, barriers to adoption remain, particularly around security and performance in a multitenant environment. Similar concerns were raised in relation to early deployments of shared network infrastructure. It is important for service providers to recognize and respond to these concerns with IaaS deployments that meet enterprise requirements.

Realizing IaaS

IaaS requires a virtualized data center architecture and a runtime operations management architecture to deliver:

- Orchestration
- SLAs
- IP NGN integration
- Billing and chargeback
- IT services management alignment.

To operate IaaS effectively, service providers will need to scale their service delivery infrastructure progressively in response to business demand. At scale, service providers will need automated, secure operational processes, proactive management tools, open integration mechanisms, and customer self-service capabilities that will allow them to support very large volumes of secure service transactions across a multitenant infrastructure with no degradation of service quality, on-demand responsiveness, and the ability to rapidly recruit new services and customers to its platform with minimal delay.

There are a number of important success factors:

- Understanding and controlling the costs involved in delivering different types of services
- Devising metrics that will drive performance optimization at scale
- Automating customer self-service as far as possible to reduce costs in a dynamic, high-volume environment
- Helping ensure that the service delivery infrastructure can track the behavior of potentially millions of customers at high scale.

Cisco has an architectural blueprint for rapid transition to IaaS, utilizing proven architectures, products, technologies, designs, processes, and services. The Cisco approach enables service providers to minimize additional investment by utilizing foundation technologies based on a unified service delivery strategy and capitalizing on their IP NGN and data center assets.

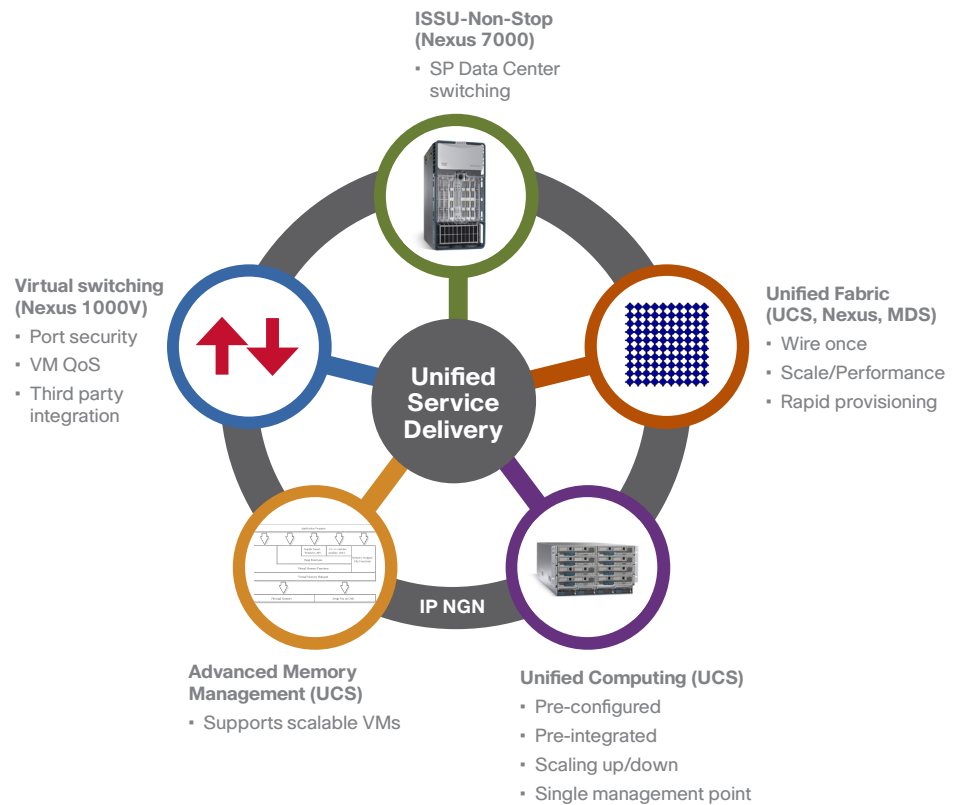
Figure 5. Unified Service Delivery Trusted Pathway to Cloud Service Offers



The USD strategy was discussed in detail in an earlier Cisco briefing paper: “Transforming data center complexity to velocity.” USD represents a new way of thinking about service delivery infrastructure in the data center and the network all the way to the end customer. It is based on tight integration between the application software and the whole network delivering services to the end user, creating a secure, virtualized service-oriented infrastructure for multiple integrated business and consumer services. As well as delivering immediate cost, quality, revenue, and performance benefits, a USD solution helps ensure that service providers are prepared for a later transition to ubiquitous cloud services such as IaaS, however they evolve.

USD brings together primary data center elements of unified computing, third-party virtualization, and unified fabric with the communications capability of an IP NGN offering network intelligence and quality, security and application performance, media-aware distribution, peering, and interconnect. These foundation technologies help ensure that quality and performance to the end user are not compromised.

Figure 6. USD Foundational Technologies Dynamically Enable IaaS Services



Building on a USD platform will help service providers achieve a range of business and operational benefits:

- Accelerate time to market for new services through the use of common integrated compute, storage, and networking components
- Improve efficiency through workload balancing with a common platform to support efficient shifting of workloads based on user demand
- Balance capital and operating costs while investing for revenue growth
- Increase asset utilization through virtualization of servers, storage, and networking
- Help ensure and secure the user experience by offering the highest levels of security for customer data in transit and within the data center
- Enhance the user experience by delivering media-rich services to millions of users with 24x7x365 availability through carrier-class scale and resiliency.

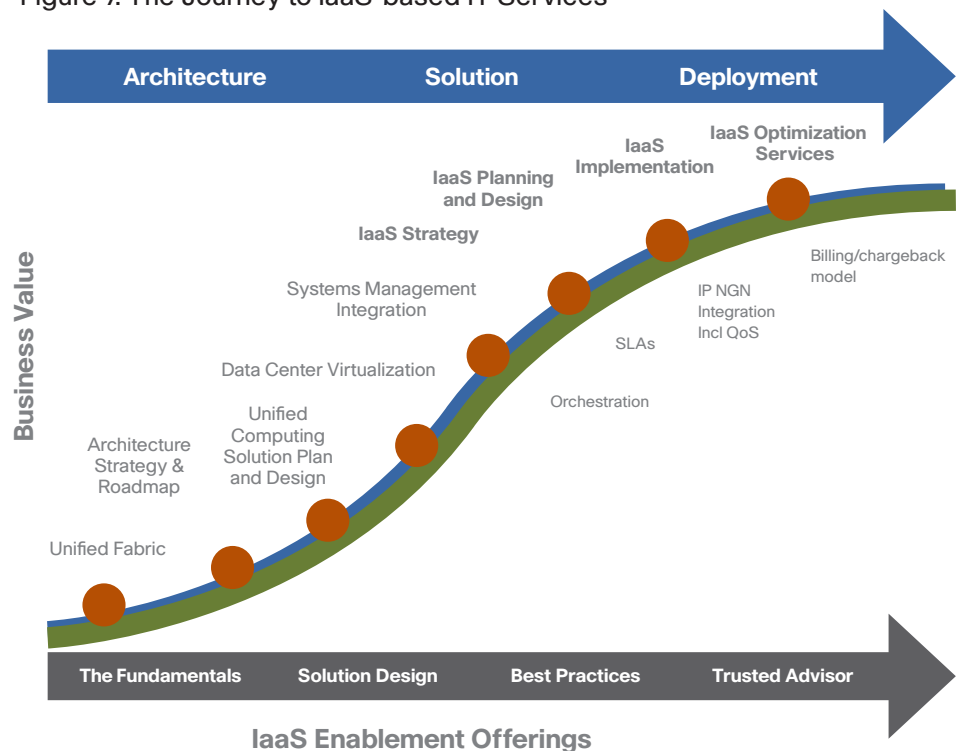
The combination of unified data center technologies, IP NGN communications, and advanced enablement services to integrate the solution makes Cisco IaaS unique: a holistic offer solution that enables the data center to deliver services to the end user with end-to-end performance, quality and scalability, flexibility, reduced cost through virtualization, and faster provisioning.

Evolving the Data Center

Service providers might be at different stages of the journey to IaaS. Cisco has identified a number of primary stages:

- Deciding the architectural strategy and services
- Deciding to unify the fabric within the data center
- Developing a unified computing solution plan and design
- Increasing the degree of data center virtualization
- Hardware planning
- Systems management integration
- Designing management architecture
- Implementing cross-functional project management.

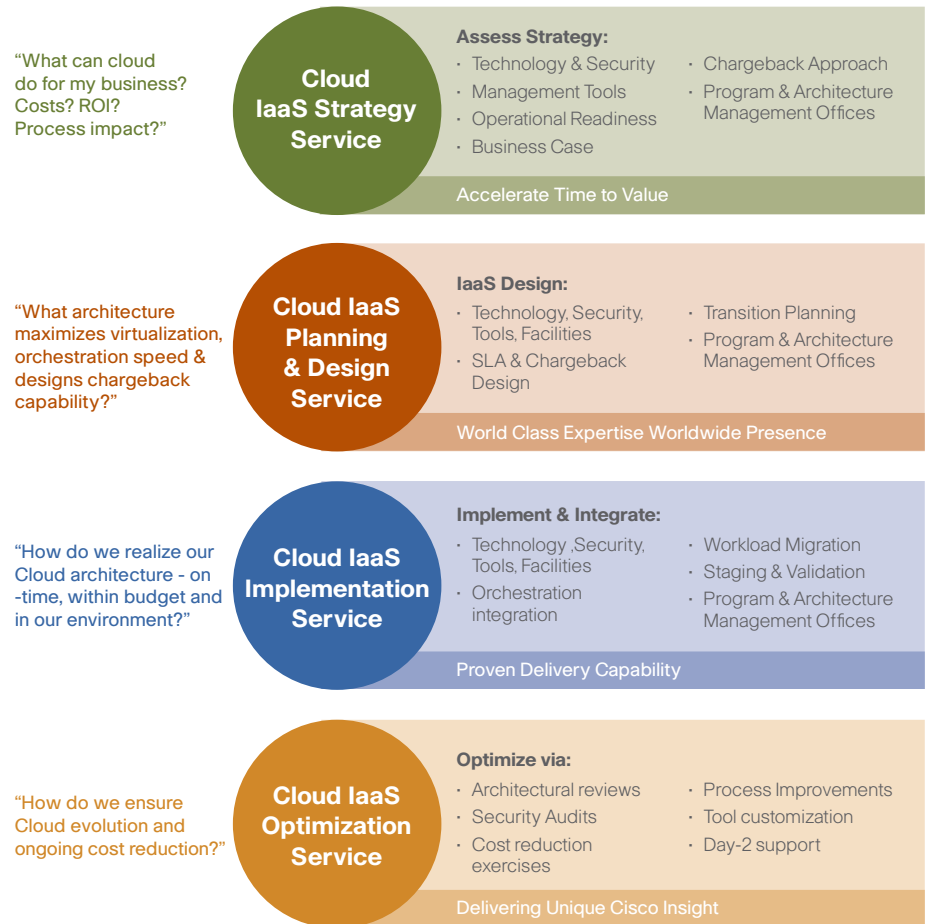
Figure 7. The Journey to IaaS-based IT Services



Cisco's IaaS Enablement Services map the different stages of the journey so that evolution can take place from the most appropriate point. The services are:

- Cisco IaaS Strategy Service to help evaluate the most appropriate strategy for IaaS adoption
- Cisco IaaS Planning and Design Service to plan and design a best in class IaaS architecture, orchestration tools strategy, and IT Services Management process, delivering an end-to-end IaaS adoption blueprint
- Cisco IaaS Implementation Service to realize the design blueprint, via extensive integration and implementation services.

Figure 8. Cisco Advanced Services Cloud Enablement Services Summary



Cisco’s IaaS Enablement Services offer a number of important benefits:

- Help service providers understand and improve the state of operations, change, and configuration management processes and systems
- Reduce time to successful deployment and operation of complex IaaS solutions
- Reduce risk by using experts who have substantial experience already around IaaS
- Use proven Cisco validated designs for IaaS
- Provide access to a single vendor capable of addressing the entire lifecycle of an IaaS solution
- Use the full capabilities and feature set of the infrastructure devices, including:
 - Dynamic allocation of resources
 - Segregation of different aspects of infrastructure
 - Critical layers of security from top to bottom, from applications to virtualized infrastructure, and edge to core; security is not relegated or limited to simply the application layer.

These professional services underpin Cisco's demonstrable integrated design for rapid deployment and dynamic provisioning of IaaS. The design is scalable, secure, resilient, fully tested, and documented. Cisco has also developed detailed IaaS product configuration and deployment guides that greatly reduce both the risk and time to deploy services. The guides are based on a service provider case study that represents a real life model. The case study demonstrates the performance of IaaS in an environment that features high-bandwidth switching and massive VM scaling. The deployment was fully documented, tested end to end, and designed and built as an integrated solution.

Utilizing professional services can overcome the limitations of an internally focused approach, using already stretched in-house resources, where suboptimal solutions result in problems such as:

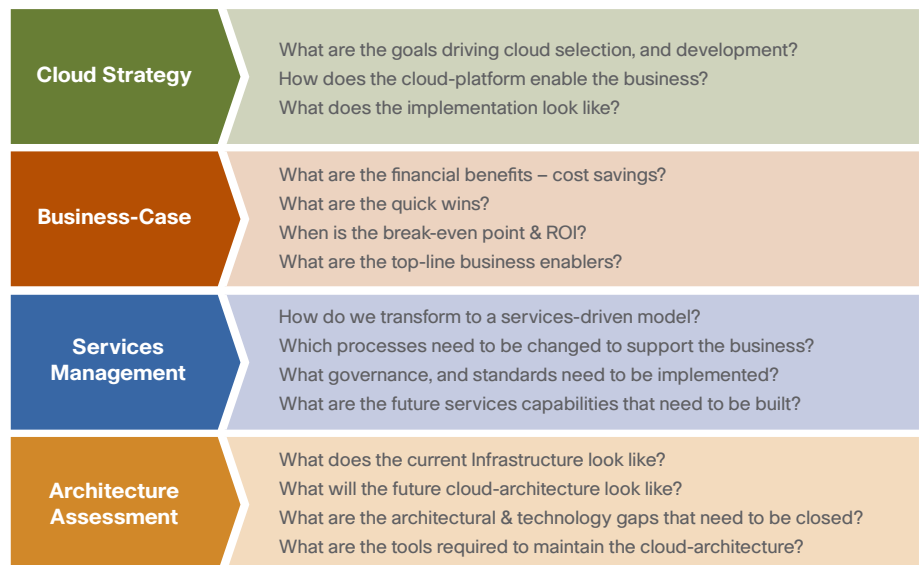
- Limited virtualization around the endpoint computing resources
- Failure to exploit innovative, cost-saving initiatives such as disaster recovery within IaaS
- Security inadequately focused at the application layer only
- Lack of customer isolation using secure, scalable multitenant services.

Developing an IaaS Strategy

Service providers must consider what their IaaS strategy should be to maximize business benefit. Cisco believes that it is essential to take an overarching approach to strategy development. Service providers who do not take this overarching approach are at risk of losing competitive advantage through failure to realize an IaaS operational model.

Service providers who embark on an IaaS architecture design without first detailing the strategic objectives and assessing ROI might find that their IaaS project fails to deliver business benefit. Decision makers who fail to recognize that cloud is an operational model, not just a technology, are more likely to invest heavily in projects that overrun and fail to deliver measurable benefits.

Figure 9. Cloud Business Strategy Service



The key to successful realization of IaaS business benefits is to take a holistic approach across strategy, ROI-driven architectural decisions, tools, people, and process changes required to deliver the promise of IaaS. This holistic approach stems from clear recognition that adoption requires not only a virtualized data center architecture, but also a runtime operations management architecture. Cisco's IaaS Strategy Service addresses the needs of both aspects, helping service providers:

- Determine whether IaaS is appropriate
- Strategize, justify financially, and roadmap a transition to IaaS
- Develop an IaaS business model, including a financial ROI model
- Establish primary metrics and performance indicators to evaluate investments and returns
- Assess costs, benefits, and operational changes needed to benefit
- Identify the strategy that will accelerate time to revenue

- Develop an IaaS architecture with the most appropriate technology, security, orchestration, and billing/chargeback mechanisms to cost-effectively realize the planned business benefits.
- Evaluate the current and required services management approach
- Develop an IaaS security and compliance strategy
- Identify how best to transition to a service-driven model, with proposals for both quick wins and longer-term gains.

The Cisco IaaS Strategy Service uses series of ROI tools, questionnaires, and workshops to evaluate current approaches and planned outcomes, setting out a strategy for transition to a service-driven model and helping ensure that architectural development and implementation align with business objectives.

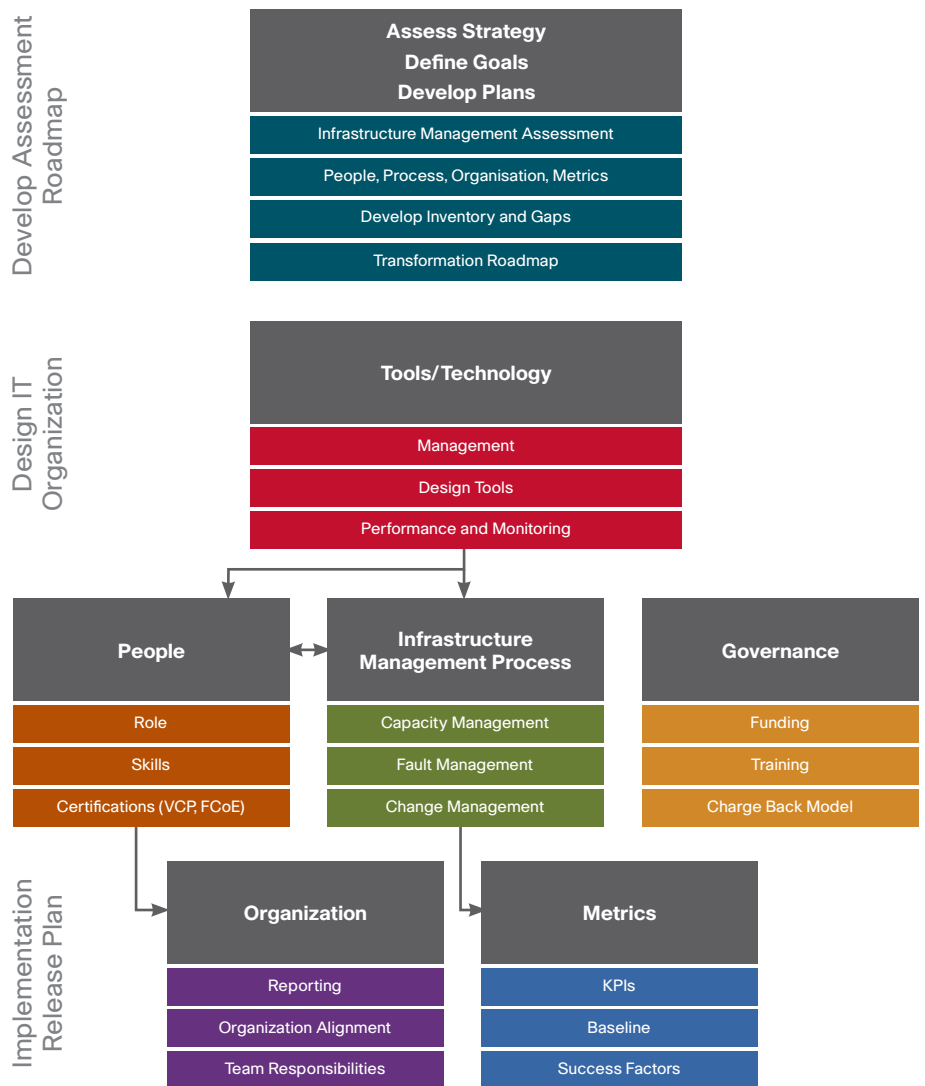
As part of the strategy development process, service providers can measure their IaaS deployment on four basic metrics:

- How long it takes to acquire and deploy new third-party services or to enhance existing services
- The cost of delivering, supporting, and managing each service
- The relative complexity of services
- The revenue uplift that can be gained from adding new capabilities and serving new markets.

Planning and Design

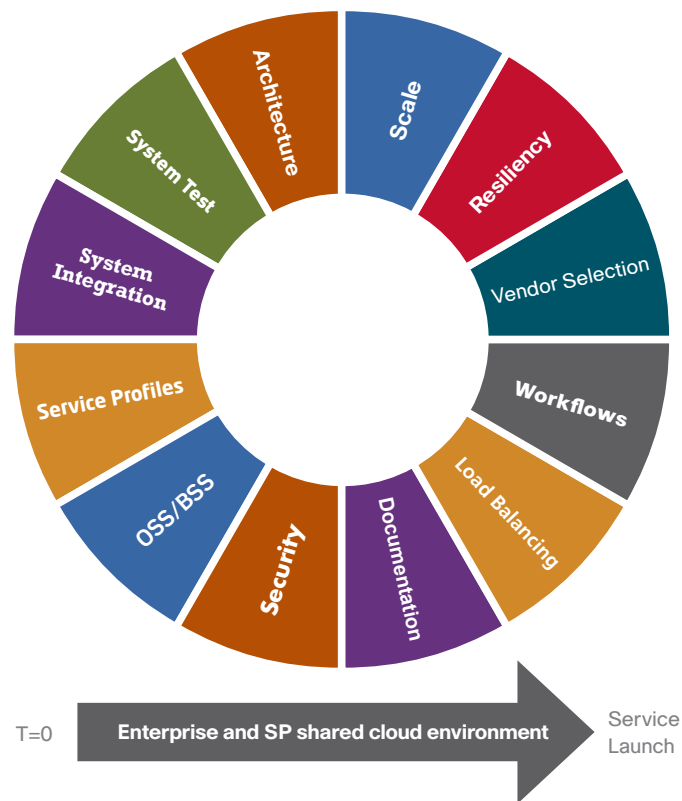
It is important to recognize that IaaS projects are not based on technology alone. IaaS is an operational model requiring an end-to-end approach covering network, storage, virtualization, and technology strands plus management tools, alignment of people, and process and operational readiness.

Figure 10. VOMA Steps to Success



The planning and design stage is critical in linking the strategic business objectives with a viable overarching design that prepares the foundations for the subsequent implementation and integration activities. It must identify the end-to-end architectural approach appropriate to deliver the chosen strategy while to maximizing virtualization, orchestration speed, and design chargeback capability.

Figure 11. Instantiating Infrastructure-as-a-service
Complex Design, Development and Test Challenges



Cisco can support this stage with an IaaS Planning and Design Service that covers:

- Technology, security architecture
- Management tools architecture
- Facilities design
- Operational readiness roadmap
- SLA chargeback design
- Transition planning.

The service helps service providers realize the target IaaS architecture as a detailed design, covering the network, server, SAN, tools, processes, and people required for an operational model. It is underpinned by existing Cisco core competencies in network, compute, storage, tools, and process improvement and expertise in delivering advanced, virtualized data centers.

A primary element of the Cisco service is an overarching Program Management Office, to help ensure completion of all design activities as well as successful project execution and coordination of all customer Cisco partner activities. This helps to ensure transparent, on-time delivery. The service also features an Architecture Management Office where an embedded architect helps ensure adherence to the IaaS architectural design, which is crucial to realizing the business benefits of the transition.

Implementation

The primary challenges at this stage are to realize the architecture, tools, and processes needed to deliver a fully operational IaaS architecture and to resolve any people and process issues that might affect successful IaaS adoption.

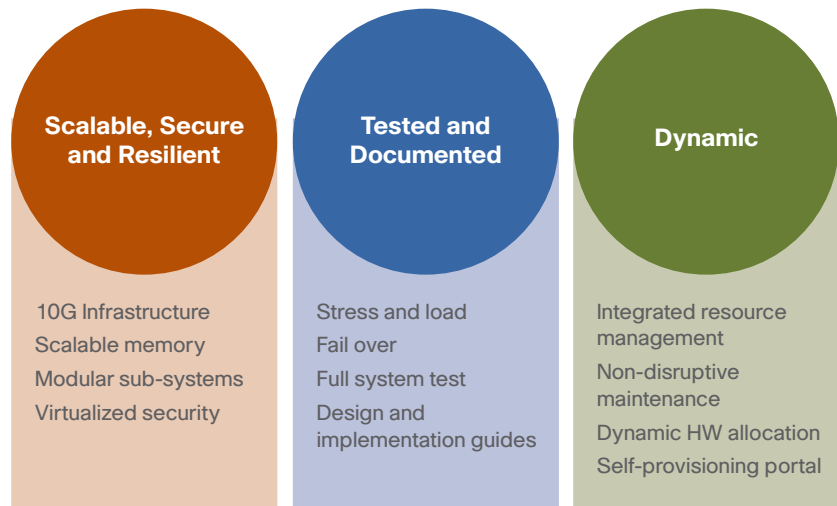
Implementing and launching an IaaS project are a significant, potentially risky and long-term investment given the complexity of any transition from current generation IT approaches to one empowered by a new operational model. Cisco's experienced approach to the integration and staging activities involved in this environment substantially reduces the risk of project failure and assures alignment with the return on investment metrics defined during the Cisco IaaS Strategy Service. This service also helps ensure compliance with the overarching technology architecture, and process and tools designs, delivered in the Cisco IaaS Planning and Design Service.

The service uses internal Cisco's inside track and intellectual property, best practice, proven methodologies, and best-in-class Cisco partners to accelerate and assure the implementation of IaaS architectures, tools, and processes and deliver a fully operational end-to-end IaaS solution.

The service covers:

- Architecture implementation
- Tools orchestration integration
- Application migration
- Workload migration
- Staging and validation
- Program management office
- Architecture management office
- Technical governance
- Knowledge transfer.

Figure 12. Fast Track Design of IaaS Compute Demonstratable Integrated Design, Rapid Deployment, and Dynamic Provisioning

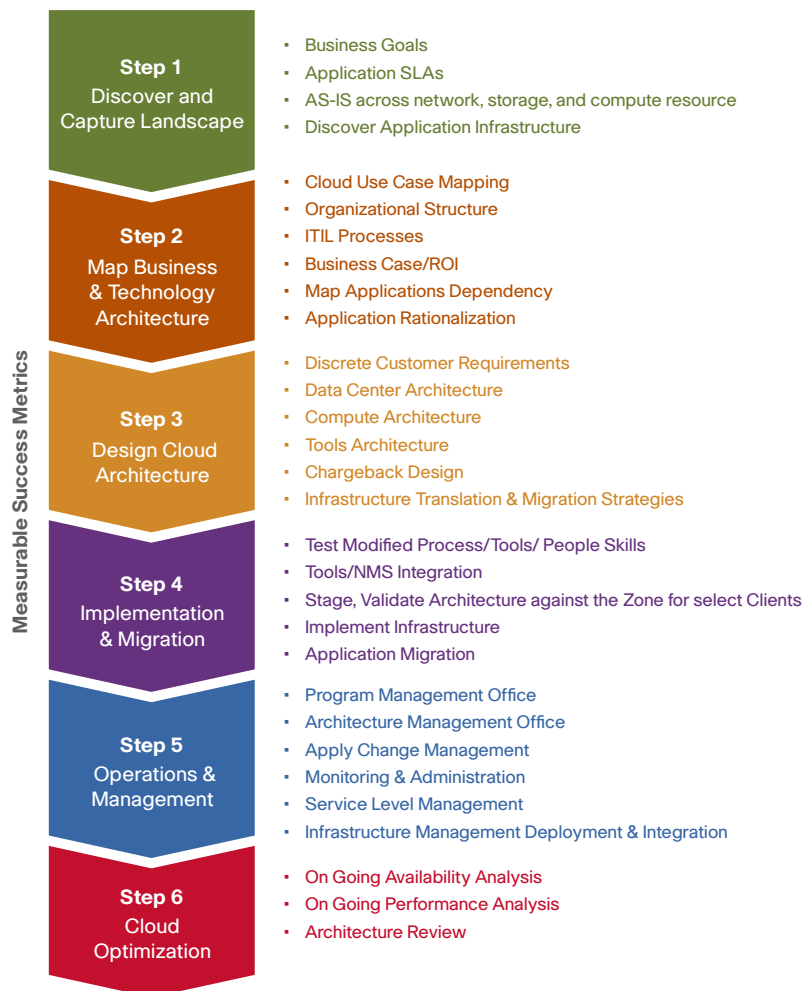


To help ensure fast track delivery, Cisco's IaaS offering is based on preengineered solutions together with a design guide, configuration, test suites, documentation, and ROI tools that eliminate service to delivery time delays. A build/operate/transfer option is also available where Cisco builds and proves the installation before handover. Cisco's inside track into networking equipment and Unified Computing Systems helps ensure that the service provider benefits from the best possible implementation.

Benefits of a professional service-oriented approach

Cisco IaaS Enablement Services take the service provider through the complex journey from strategy formation, to architectural development, process alignment, and chargeback design to implementation and go-live of the IaaS operational model. Recognizing that IaaS, as a new and potentially revolutionary operational model, is more than a technology architecture or operating system, Cisco's approach is to comprehensively address strategy, architecture, and implementation across not only technology, but also tools, people/process, SLA, and billing/chargeback. The Cisco services approach uses best practice methodologies and the unique Cisco intellectual property that can come only from a developer of the primary enabling technologies of IaaS.

Figure 13. The Six Steps to Success for Data Center Consolidation, Virtualization and Cloud, Migration, and New Buildout Efforts.



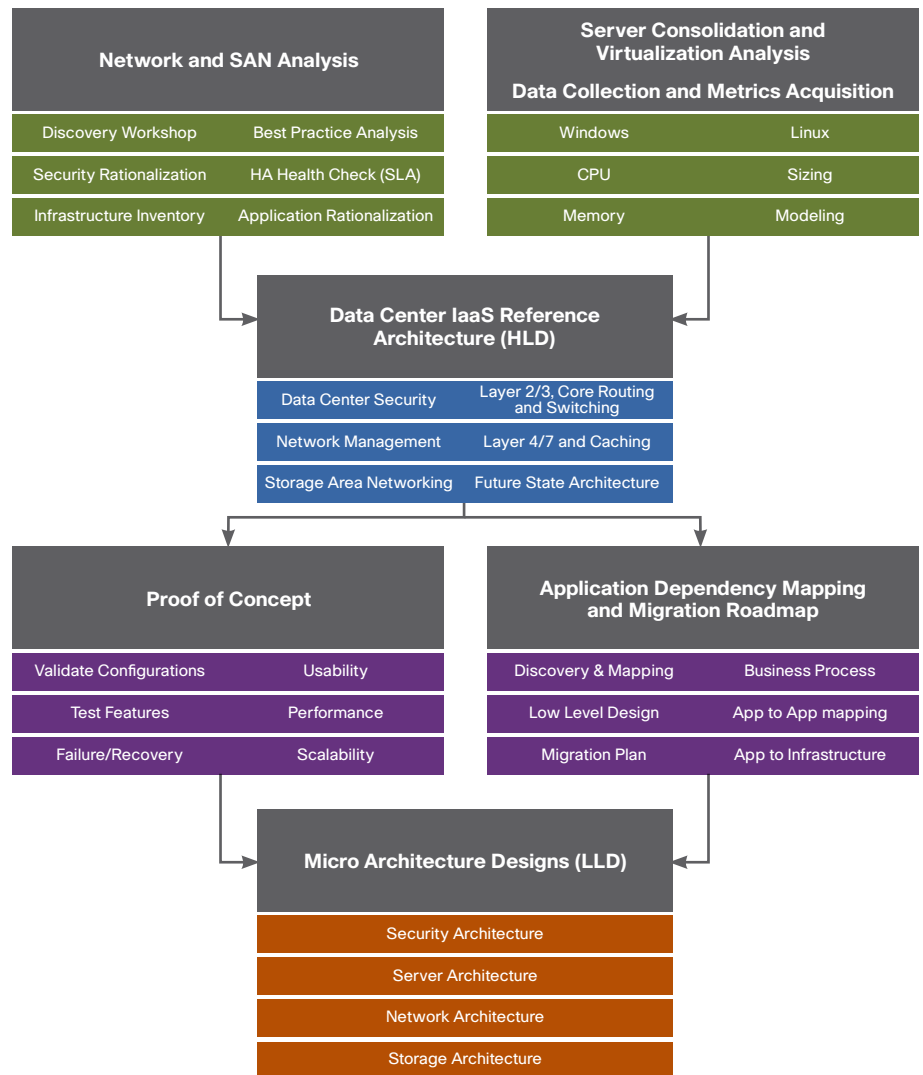
Cisco IaaS Enablement Services help service providers to:

- Accelerate the development of a financially justified strategy
- Help ensure the alignment of IT services, management, people, and process to business objectives
- Accelerate the development and implementation of a Cisco validated IaaS architecture, integrated tool design, and chargeback mechanism
- Create a phased migration plan to help ensure successful adoption of the new IaaS operational model
- Accelerate time to value of the Cisco data center architecture for IaaS services delivery
- Accelerate time to value of Cisco Unified Service Delivery as the primary enabler of IaaS services
- Reduce overall costs
- Realize and maximize virtualization benefits
- Avoid operational management risks
- Transform organization from silos to services centric
- Rationalize SLAs using applications discovery and analysis
- Achieve phased migration approach with cumulative benefits
- Enhance skills using knowledge transfer.

Why Cisco?

Cisco's approach and differentiation in IaaS come from a heritage of network capabilities and the inside track on IaaS foundation technologies.

Figure 14. IaaS Steps to Success
End to End Architecture



The Cisco advantage for enabling IaaS in a service provider environment is based on clear recognition that IaaS adoption requires not only a virtualized data center architecture, but also a runtime operations management architecture. Cisco accelerates time to value for delivery of IaaS, in contrast with alternative approaches that fail to recognize that IaaS is not so much a technology, but a new operational model for delivery of IT services. Cisco's service approach across IaaS architecture, infrastructure management tools for rapid orchestration of new services, service oriented billing and chargeback mechanisms, and IT services management people and process alignment, coupled with extensive experience in delivering true end-to-end, virtualized data centers, enables service providers to deliver business agility and measurable return on investment to enterprise customers.

Cisco's IaaS offer also incorporates features that enhance the service provider's competitive and operational advantage, including:

- Security and application performance
- Ability to offer SLAs
- Service provider class scaling
- Ease of migration of existing data centers and their evolution to support future services
- Low initial investment for service trialing and introduction
- Designs validated by Cisco, including third-party technology
- Reduced risk in deploying new services
- Rapid introduction of new services
- Developed from trusted, secure, tested USD elements
- Advanced virtualization and VM management from source to destination
- Advanced IaaS enablement services
- Best practice in management.

The unique Cisco lifecycle approach to services defines the requisite activities at each phase of the IaaS lifecycle to help ensure service excellence. With a collaborative delivery methodology that joins the forces of Cisco, a skilled network of partners, and our customers, we can help service providers achieve the best return on their investment in IaaS.

For more information on IaaS from Cisco, please contact <email address>




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