Build application-centric data centers to meet modern business user needs

Cisco® Application Centric Infrastructure (ACI) integrates Citrix NetScaler application delivery controller (ADC) appliances to reduce deployment complexity and better align applications with dynamic business requirements in existing and next-generation data centers.

Meeting current business challenges

New approaches are redefining IT as the web economy shifts to mobile and application-centric services. IT consumption models are increasingly becoming cloud-based, with a do-it-yourself (DIY) stance and increasing focus on development and operations integration (DevOps) and the concept of anything as a service (XaaS). With the changing character of applications and the evolving requirements for the development and management of these applications, enterprise and service provider IT leaders are seeking and expecting a simple, flexible, automated, and agile infrastructure that better aligns with the needs of the entire application lifecycle from development to deployment.

To address these changing requirements in the data center, Cisco offers a new architecture and operation model based on application-centric infrastructure. With tight integration between physical and virtual elements, an open ecosystem model, and innovation spanning application-specific integrated circuits (ASICs), hardware, and software, Cisco ACI takes a holistic system-based approach to IT. This unique approach uses a common policy-based operating model across network, computing, storage, and security elements, overcoming isolated infrastructure and drastically reducing cost and complexity.

With Cisco ACI, applications guide networking behavior, not the other way around. This approach redefines the power of IT, making IT more responsive to changing business and application needs, enhancing agility, and adding business value.

Cisco and Citrix share a common vision for network simplification and rapid network service provisioning. Both companies support an application-centric approach that helps address critical customer challenges in both traditional and next-generation data centers. The benefits Cisco ACI can provide to a customer's environment are greatly amplified by the use of Layer 4 through 7 services between the network and the application. Citrix NetScaler integration truly enhances Cisco ACI by enabling best-in-class use of Citrix NetScaler ADC services tightly coupled with the network.

A secure, policy-driven architecture

Achieving the vision of a truly agile, application-based data center requires a flexible infrastructure that can rapidly provision and configure the necessary resources independent of their location in the data center. With Cisco ACI, this is achieved with the Cisco Application Policy Infrastructure Controller (APIC), a centralized policy management and control point for the entire infrastructure (Figure 1).
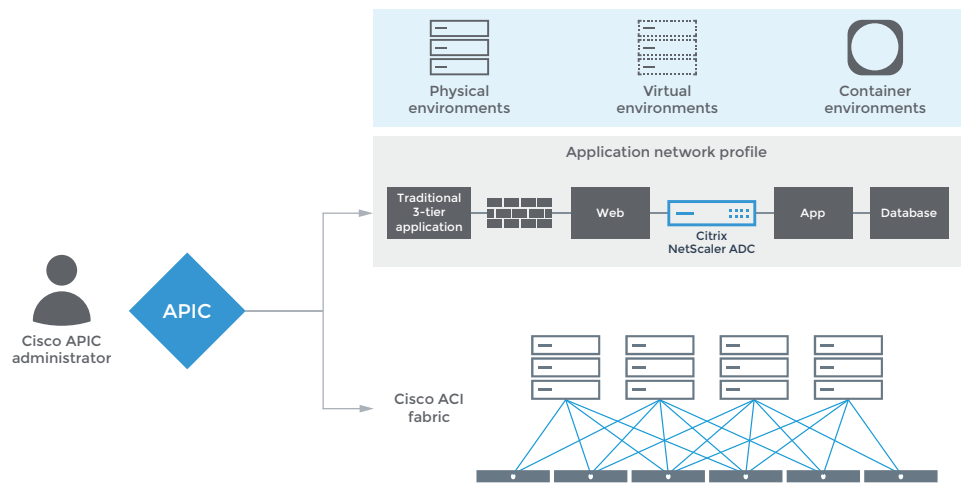
Figure 1. The Cisco ACI and Citrix NetScaler ADC solution

The Cisco APIC addresses the two main requirements for achieving the application-centric data center vision:

- Policy-based automation framework
- Policy-based service insertion technology

A policy-based automation framework enables resources to be dynamically provisioned and configured according to application requirements. As a result, core services such as firewalls and Layer 4 through 7 switches can be consumed by applications and made ready to use in a single automated step.

A policy-based service insertion solution automates the step of routing network traffic to the correct services based on application policies. The automated addition, removal, and reordering of services allows applications to quickly change the resources that they require without the need to rewire and reconfigure the network or relocate the services. For example, if a business decides to use an application firewall found in a modern ADC as a more economical way of achieving Payment Card Industry (PCI) compliance, administrators simply need to redefine the policy for the services to be used for the related applications. The APIC can dynamically distribute new policies to the infrastructure and service nodes in minutes, without requiring manual changes to the network.

Device package integration

A key benefit of the Citrix NetScaler and Cisco ACI solution is tight integration. Using a full-featured device package, a rich set of ADC features and deployment templates are exposed to and controlled by the APIC.

The APIC and NetScaler are integrated using Representational State Transfer (REST)-based open APIs. A device package uploaded to the APIC enables it to perform detailed, feature-level configuration of NetScaler services (Figure 2). These services include:

- Authentication, authorization, and accounting (AAA)
- Application firewall
- Cache redirection
- Compression
- Content acceleration
- Content switching
- Citrix NetScaler DataStream
- Domain Name Service (DNS)
- Global server load balancing
- Integrated caching
- Load balancing
- Secure Sockets Layer (SSL) offload
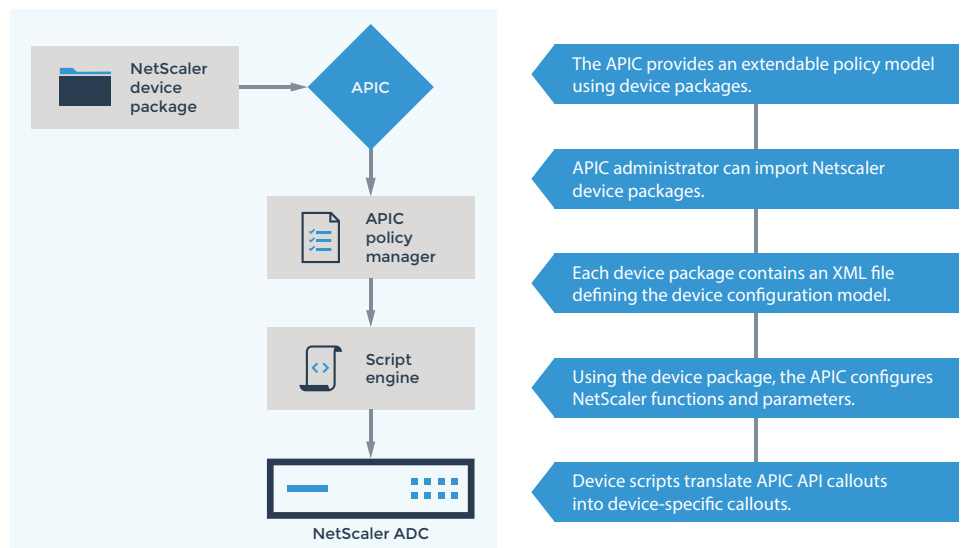- SSL virtual private network (VPN)

Figure 2. Citrix Netscaler device package functions

Policy-based service insertion

The Cisco APIC policy-based service insertion solution automates the step of routing network traffic to the correct services based on application policies. This approach enables Layer 4 through 7 resources to be dynamically provisioned and configured according to application requirements on a per-tenant basis.

The APIC offers a drag-and-drop graphical user interface (GUI) to easily create Layer 4 through 7 service graphs that specify network traffic routing. All Layer 4 through 7 ADC features available in the Citrix NetScaler device package can be included in a service graph definition, allowing complete NetScaler integration with the APIC.

Once created, a service graph can be assigned to an application profile and contracted to a data center tenant, thereby defining the network traffic flow for that specific application and tenant.

Cisco's application-centric service insertion framework allows the APIC to dynamically distribute new policies to the infrastructure and service nodes in minutes, without requiring manual changes to the network.

Deployment flexibility and choice

Cisco and Citrix offer three deployment modes for the ACI and NetScaler solution, so you can choose the automation strategy that works best for your organization today and as needs change over time (Figure 3).

Service Policy/Managed Mode

In Service Policy or Managed Mode, the entire Layer 2 through 7 stack is controlled and automated using the Cisco APIC. Network services are dictated by the device package and managed by the APIC. The device package is provided by the device vendor, who decides which features are exposed, and uploaded to the APIC.

Overall, this mode delivers comprehensive, industry-leading device package integration and a fully automated stacks with centralized control.

Network Policy/Unmanaged Mode

In Network Policy or Unmanaged Mode, the Cisco APIC only manages and automates the network until network traffic reaches the device. Layer 4 through 7 servers are managed outside Cisco ACI by the service device controller. Once the device has performed its tasks, the network traffic generated is again managed by the APIC. This mode requires
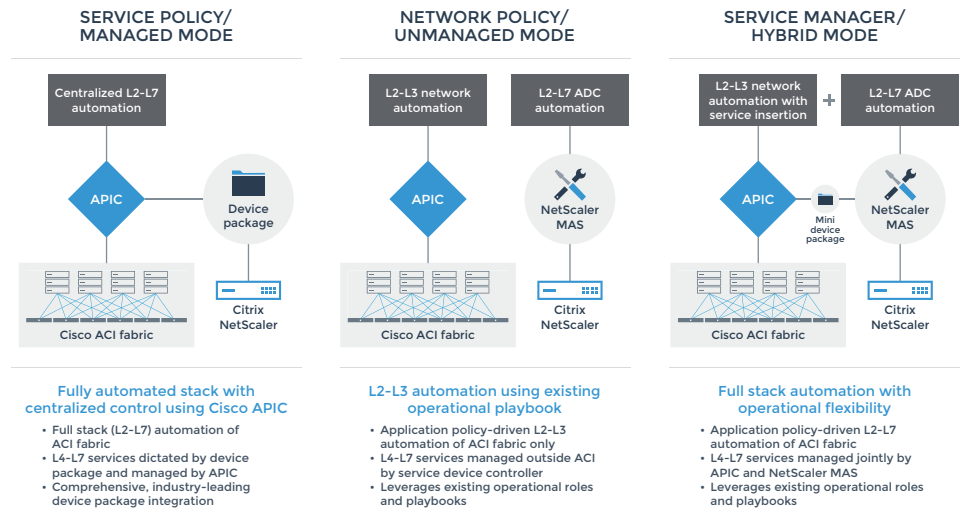
SERVICE POLICY/ MANAGED MODE	NETWORK POLICY/ UNMANAGED MODE	SERVICE MANAGER/ HYBRID MODE

Fully automated stack with centralized control using Cisco APIC
- Full stack (L2-L7) automation of ACI fabric
- L4-L7 services dictated by device package and managed by APIC
- Comprehensive, industry-leading device package integration

L2-L3 automation using existing operational playbook
- Application policy-driven L2-L3 automation of ACI fabric only
- L4-L7 services managed outside ACI by service device controller
- Leverages existing operational roles and playbooks

Full stack automation with operational flexibility
- Application policy-driven L2-L7 automation of ACI fabric
- L4-L7 services managed jointly by APIC and NetScaler MAS
- Leverages existing operational roles and playbooks

Figure 3. Cisco ACI and Citrix NetScaler solution deployment modes

manual network stitching. As a result, you must provide information about:

· Which port the service device connects to.

· Which ports are part of a cluster.

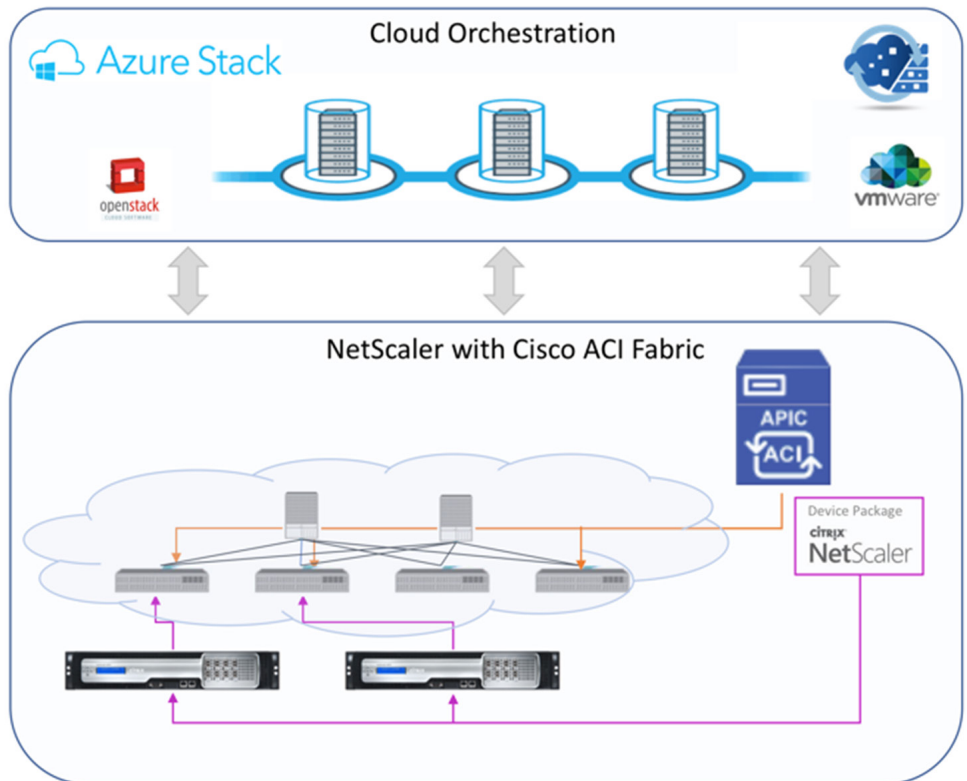· The device operation mode: [routed/go-to mode](), [transparent/go-through mode](), or [one-arm mode]().

Overall, Network Policy Mode leverages existing operational roles and playbooks to automate Layers 2 through 3, while Layers 4 through 7 are managed by the service device controller.

Service Manager/Hybrid Mode

In Service Manager or Hybrid Mode, Layer 4 through 7 services are managed jointly by the Cisco APIC and the Citrix NetScaler Management and Analytics System (MAS). Layer 2 and 3 network services are configured and automated by the APIC. Using a specialized device package, more nuanced Layer 4 through 7 feature configuration is possible. As with Service Policy Mode, Hybrid Mode also requires a device package to be uploaded to the APIC. However, the function of the device package differs. Hybrid Mode allows

the device package developer to customize and manage a subset of Layer 4 through 7 feaures through the APIC using a version of the device package that enables communication between the APIC and the service device controller. As a result, you can manage service devices through the APIC while keeping the full native functionality and customizable parameters available from the service device vendor. For example, security device management is enhanced. A security administrator can manage security policies through a dedicated security controller while configuring network paramaters and assigning security policies to a network using the APIC.

Overall, Hybrid Mode leverages existing operations roles and playbooks to provide a compromise between Service Policy and Network Policy Modes with both full-stack automation and operational flexibility.

Cloud Orchestration / Azure Stack / openstack / vmware

NetScaler with Cisco ACI Fabric / APIC ACI / Device Package CITRIX NetScaler

Seamless cloud orchestration

The newly introduced Cloud Orchestrator Mode feature in Cisco APIC enables Layer 2-7 automation for private, hybrid, and public clouds and ensures smooth operations. This mode is particularly useful in scenarios where Cisco APIC works with Cloud Orchestrators such as Azure Stack. In this mode, the Cloud Orchestrators need not be aware of the configuration semantics of Citrix NetScaler application delivery controllers. The Cloud Orchestrator mode provides a standard set of parameters that create a unified interface for provisioning Citrix NetScaler in the Cisco ACI fabric. Citrix NetScaler exposes a set of ADC attributes as ADC schema and these attributes are mapped in Citrix Device Package Function Profiles. The cloud administrator can set values for these attributes while provisioning the ADC service via the cloud orchestrator. This solution is not specific to a particular orchestrator, and hence the administrator is free to pick any orchestrator depending on their business need and the Device Package works seamlessly to provision and configure Citrix NetScaler.

The business benefits of automation

Through data center automation, the Cisco ACI and Citrix NetScaler solution delivers many benefits and IT advantages, including security, agility, and scalability.

Security

Implement comprehensive security while ensuring compliance with industry standards using native Cisco ACI security and Citrix NetScaler security services.

- **Defend your business** using a multi-layered, zero-trust, whitelist-based approach to security. Increase network defenses with multiple layers of ACI security. Quarantine malware-affected servers and virtual machines based on their attributes with micro-segmentation. Detect threats faster with extensive network visibility. Simplify security enforcement and monitoring with NetScaler AAA.

- **Protect your users** with a solution that combines policy-based management with SSL, VPN, and application firewalls. Defend applications by provisioning

NetScaler security services with the Cisco APIC. Provide deeper protection for application by integrating new security capabilities from an open ecosystem. Easily change and apply new security settings using policy tracking.

- **Maintain compliance** through policy-based control, micro-segmentation, and multi-tenancy services that simplify management and administration. Conform to industry security requirements using system-wide policies. Organize sensitive resource and data easily with multi-tenancy and micro-segmentation. Anticipate, detect, and respond to compliance risks with continuous policy monitoring.

Agility

Rapidly address business changes with infrastructure management tools that feature uncompromising integration between Citrix NetScaler and Cisco ACI.

- **Boost system reliability** with monitoring services that intuitively present network health information to enable proactive network management. Enable data-driven improvements with monitoring and logging. Reduce mean time to repair by up to 80% with automated remediation.
- **Easily adapt to change** through

comprehensive policy-based management of Layer 4 through 7 services. Enhance network flexibility with policy-based insertion that automatically attributes the right resources to applications. Protect your investment with open protocols. Adopt DevOps with a collaborative policy model that enables developers and operations to work together.

- **Deploy quickly** by easily propagating policies and services across physical, virtual, and container environments using a common platform. Reduce deployment time by 90% with Cisco services and technical support. Lower risk with a tried, tested, and validated reference architecture in use by more than 1,400 customers. Improve flexibility with multiple deployment modes to choose from.

Scalability

Maintain uncompromised performance across multiple applications—even as demands fluctuate—through Citrix NetScaler services that work directly with Cisco ACI.

- **Optimize infrastructure assets** using multiple, dynamic load-balancing techniques managed and automated by the Cisco APIC. Improve backend server performance by offloading encryption and

"We are excited by the direction Citrix has taken with NetScaler and their integration with Cisco ACI. We believe that a concrete SDN solution with L4-7 automation is a game-changer in how next-generation data centers will operate and deploy applications."

Matt Chamley | Head of Global Infrastructure | Woolworths

decryption tasks to NetScaler. Reduce server costs by 60% and provide 100% availability with NetScaler Layer 4 through 7 load-balancing features.

- **Enhance application performance** with data caching techniques—including NetScaler Cache Redirection and in-memory NetScaler Integrated Caching—that lower the overhead associated with repeated content demands.

- **Reduce administrative costs** through centralized, policy-based management and automated full-stack provisioning. Speed service delivery with predefined policies and service graphs. Easily scale out network capacity by 32x with TriScale clustering. Simplify network management with multi-tenancy features that let you place up to 115 virtual instances and 512 partitions on a single NetScaler device.

Conclusion

As businesses quickly move to make their data centers more agile, application-centric automation and virtualization of both hardware and software infrastructure become increasingly important. The Cisco ACI and Citrix NetScaler solution can help you transform your infrastructure with accelerated application delivery, scalability, security, and ease of management, so you can better meet modern business needs.

Learn more

Find solutions guides, technical documentation, and videos at:

- www.cisco.com/go/acicitrix
- www.citrix.com/netscaler/cisco

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