Solution Overview

Cisco Intelligent WAN as a Service: Provide Businesses with Intelligent WAN Services

What You Will Learn

In order to control their WAN services costs and their user experience with important applications, WAN customers need to identify what applications are in their network, how much of the WAN they consume, and the performance of key applications. The Cisco® Intelligent WAN as a Service (IWAN-aaS) solution allows communication service providers to deliver precisely these application performance management services cost-effectively to enterprise customers, along with the tools they need to efficiently troubleshoot application performance issues and optimize the performance of key applications over individual WAN links, and over multiple WAN links used in combination.

By building an application performance service based on a Cisco IWAN-aaS solution, service providers can help their subscribers control their IT WAN costs and provide accurate visibility and granular control of applications while offloading application performance management operations.

The IWAN-aaS solution is based on Cisco built-in router instrumentation and does not require deployment of probe devices. Service management can be delivered from a virtualized multiservice data center (VMDC) architecture, which allows the service provider to bundle this service with other cloud services, including security, collaboration, infrastructure as a solution (IaaS), and application services.
Challenges

Cloud and Communication Service Provider Challenges
Communication service providers (CSPs) who currently deliver IP VPN and Internet access services are experiencing revenue decline, lower service adoption, and customer churn. Service providers see an increasing number of businesses adopting services delivered from over-the-top (OTT) players. These OTT cloud service providers are diluting network relevance and represent a risk of commoditization for connectivity services. CSPs need a new strategy that will allow them to regain their position in the market. As more and more applications migrate into the cloud and best-effort Quality of Service (QoS) is no longer an appropriate solution, a new breed of intelligent network services is required: CSPs must evolve their network service offerings toward application-aware network services.

Application-aware network services are not new. A number of service providers have already developed these services, based on a combination of specialized network appliances and software clients deployed on customers’ devices. The complexity and the costs associated with the deployment and maintenance of these on-site appliances and software agents have made these service offerings unaffordable for many businesses and resulted in very low adoption.

Service provider operation teams are missing tools to efficiently and cost-effectively troubleshoot end-customer application performance issues, which take a longer time to diagnose and fix outages, resulting in poor customer satisfaction.

Enterprise Challenges
IT is undergoing transformation. This transformation is being driven by an influx of new devices, mobile workers, cloud-based computing, and the explosion of users accessing public cloud applications, as well as increased demands for productivity—all without increases in IT budgets.

As businesses transition to virtualization and cloud and allow employees to use their own devices in the enterprise, application delivery and security have become significantly more complex. Virtualization, cloud, and the bring-your-own-device (BYOD) trend multiply the traffic traversing the enterprise network, so that businesses cannot predict application performance. IT needs to gain visibility into the types of applications on the network and be able to correctly prioritize traffic and select optimal paths.

Businesses have discovered the operational efficiencies of on-demand applications in the data center. They are now expecting their service provider to provide the same level of operational efficiency through the delivery of on-demand, application-aware network services.

Business Benefits
Cisco IWAN-aas solutions allow service providers to deliver application-aware connectivity and differentiated cloud services to their business customers without having to deploy specific hardware probes at each customer location and without cloud infrastructure.

Cisco IWAN-aas solutions provide the following significant benefits for both service providers and customers.

For Service Providers
• Incremental revenue on service and up-sell bandwidth (Visibility accelerates the decision to migrate to the cloud). It is easier for business customers to justify more bandwidth when they can demonstrate that existing bandwidth is being used efficiently
• Differentiated application-aware IP VPN, Internet access, and cloud services market offerings
• Customer retention through increased service relevance (stickiness)
• Operational efficiencies that reduce mean time to respond (MTTR) for a service provider’s customer care team
• Opportunity to up-sell professional services (design, build, support, maintenance, and operations)

For End Customers
• Increased day-to-day productivity through distinguishing business versus leisure usage, and deploying application class-of-service (COS) policies to protect business critical applications and control personal-use applications
• Improved end-user experience and satisfaction
• Efficient capacity planning (use of bandwidth by applications), predictability of IT cost, and IT cost savings by optimized use of network resources
• IT agility (standardized and consolidated services and management)
• End-to-end tool for troubleshooting that allows proactive management of outsourced IT infrastructure, such as application and WAN services

Cisco Intelligent WAN as a Service Solution

Solution Architecture
To deliver end-to-end application performance management services to business customers, the Cisco IWAN-aaS Solution (Figure 1) uses built-in instrumentation in Cisco physical routers deployed on the customer premises and virtual appliances hosted in the service provider cloud, customer cloud, or public cloud. This solution allows service providers to offer multiple services to each business customer, such as application visibility, control, and optimization.

Customized application policies can be implemented for each enterprise customer to best meet their business-critical application and security requirements. The service provider operates the services for all customers from a single multi-tenant service-delivery platform, enjoying significant economies of scale that can lead to lower capital and operational expenses, competitive prices to customers, and new revenue.

Figure 1. Intelligent WAN as a Service Solution Overview
Solution Product and Technologies
The Cisco IWAN-aaS solution builds on multiple technologies:

- Cisco Integrated Services Routers Generation 2 (ISRG2) and Cisco 4000 Series Routers
- Cisco Integrated Services Router Application Experience Bundles (ISR-AX)
- Cisco ASR 1000 Series Aggregation Services Routers
- Cisco Cloud Services Router (CSR1000V)
- Cisco Wide Area Application Services (WAAS) and virtual Wide Area Application Services (vWAAS)

The application-experience features of Cisco devices are managed by the service provider using a service-delivery platform from a third-party visibility vendor, such as Computer Associates, InfoVista, LivingObjects, Proxy, UBlkube, or created in-house to allow service subscribers to monitor their network resource usage, application performance metrics, and (if applicable) the performance improvements resulting from deploying the solution.

Intelligent WAN Services
With Cisco IWAN-aaS solutions, service providers can deliver the suite of services shown in Figure 2:

Figure 2. Customer Value and Revenue Opportunity

![Figure 2. Customer Value and Revenue Opportunity](image)

Figure 3. Application Visibility and Reporting

![Figure 3. Application Visibility and Reporting](image)
Application Discovery and Network Resource Usage

- **Cisco Network Based Application Recognition version 2 (NBAR2)** provides stateful deep packet inspection (DPI) for granular, application-level traffic inspection. It can identify over 1000 application signatures and define up to 120 customized application profiles, based on ports, URLs, or even payload values. Cisco NBAR is implemented on Cisco ASR 1000 Series Aggregation Services Routers (ASR 1000), Cisco Integrated Service Routers Generation 2 (ISR G2) and ISR 4000 Series, and the Cisco Cloud Services Router (CRS1000V).

  To address the evolving nature of applications, as part of service delivery, the service provider will regularly update network devices with Cisco NBAR2’s application signature protocol packs, which may be applied while the router is in service, without service disruption.


  By accessing the service provider’s cloud customer web portal, customer network administrators gain visibility into applications running in their networks and their network usage, top “talkers,” and top sites.

Application Network Usage Alerting

As a service option, service providers can generate an alarm when a flow condition occurs, for example, when an application is consuming too much bandwidth.

Application URL Hit Count Reporting

By accessing the service provider’s cloud customer web portal, network or IT administrators gain an understanding of which websites people are accessing and of application trends over time. They can also get insights into any suspicious sites that may need to be blocked. Application URL Hit Count Reporting is based on Cisco NBAR2’s capability to analyze HTTP traffic streams and observe the URLs that are being used. This information is then exported through NetFlow using the IPFIX standard.

Transactional and Media Application Performance Reporting

By accessing the service provider’s cloud customer web portal, IT administrators get visibility into:

- **Application response time (ART)**: provides visibility into application and network performance for TCP-based transactional applications. It collects metrics such application transaction time (TT) and allows the service provider and the customer to identify the source of performance degradation, by measuring the Server Network Delay (SND), the Client Network Delay (CND), the total Network Delay (ND) and the Application Delay (AD).

  ![Figure 4. Application Response Time Measurement](image-url)
• **Media application performance**: provides real-time monitoring of voice and video performance across the network and collects media performance metrics (e.g., jitter, loss). The integration with Cisco NBAR2 to identify applications accelerates media performance troubleshooting by identifying what and where the problem is and when it occurs.

**Transactional and Media Application Performance Alerting**

As a service option, service providers can generate an alarm on the occurrence of a performance metric condition indicating violation of a performance threshold.

**Media Performance Troubleshooting**

In addition to media application performance alerts using thresholds (application and media performance alerting), the service provider may offer as a service option a media performance-troubleshooting service. Media performance troubleshooting is based on the Cisco router Mediatrace capability to support their customer in performing fault isolation.

**Application-Aware QoS and Bandwidth Control**

Customer IT administrators can use the service provider’s customer web portal to define application policies so that media applications and business-critical applications that need guaranteed performance will be assigned to the appropriate classes of service that match the application performance objective in terms of bandwidth, delay, jitter, packet loss, and so forth.

Using the application classification performed by Cisco NBAR2 DPI technology on Cisco routers, this service allows customers to reprioritize critical applications or enforce application bandwidth use for individual applications or groups of applications using industry-leading Cisco Quality of Service (QoS) capabilities.

**Figure 5. Application Aware QoS and Bandwidth Control**

By accessing the service provider’s cloud customer web portal, IT administrators can centrally define application QoS policies and get access to reports that detail application bandwidth usage and performance on a per-class of service basis from the partner’s central service delivery platform. The central service delivery platform automatically updates the application QoS policies on Cisco CPE routers.
Application Optimization and Acceleration

Intelligent Path Selection
Intelligent path selection maximizes the value of multiple network paths (like MPLS + Internet) by helping to ensure the optimum usage of each available path between sites.

![Figure 6. Intelligent Path Selection](image)

Intelligent path selection uses Cisco router performance routing (PfR) capabilities to automatically choose the best path for each application flow to improve the application’s performance and availability, while optimizing the usage of each available WAN path at the same time. Path selection is performed in real time and considers connection quality parameters like network delay, jitter, and loss, as well as the available bandwidth.

Transport-Level Flow Acceleration
Transport level flow acceleration is based on the following Cisco WAAS mechanisms:

- Transport flow optimization (TFO): TFO improves application packet flow under unfavorable WAN conditions such as packet loss and small initial windows while helping ensure fairness
- Data redundancy elimination (DRE): DRE is an advanced form of network compression that uses a bidirectional database to store previously seen TCP traffic and replace redundant patterns with very small signatures. DRE can provide up to 100:1 compression depending on the data being examined
- Adaptive persistent session-based compression: This type of compression can provide up to an additional 5:1 compression
Application acceleration is based on the following Cisco WAAS capabilities:

- Protocol acceleration: Application-specific latency is reduced through a variety of application-layer techniques such as read-ahead, operation prediction, connection reuse, message multiplexing, pipelining, and parallelization, resulting in LAN-like performance despite deployment over a WAN.

- Application optimizers: Protocol-specific acceleration is available for Microsoft Windows file sharing (Common Internet File System [CIFS]); Microsoft Exchange (Messaging API [MAPI] and MAPI over SSL); encrypted MAPI [EMAPI]; HTTP, and HTTPS applications such as Oracle, SAP, and Microsoft SharePoint and Outlook Web Access (OWA); Microsoft Windows print services; UNIX Network File System (NFs); and Citrix ICA. These features improve end-user application response times, significantly improving employee productivity.

- Content prepositioning: Centralized policy-based file distribution and prepositioning can be used to push files to edge Cisco WAAS devices, accelerating software patch distribution and file access for all users.

- Print application optimization (Print AO): Increasingly, many customers are consolidating print servers at the head-end or aggregation point. For high-latency WAN branch offices, Cisco Print Application Optimization can drastically improve response time.

**Caching with Akamai Connect**

The service provider can offer a significant performance benefit to customers in branches where upgrading WAN bandwidth is prohibitively expensive, or where the service provider is responding to an RFP for lower priced Internet circuits. Typical use cases in retail, financial services, education, oil and gas, and education involve very small WAN links with a high demand for bandwidth.

The service provider provides this service option using Akamai Connect software running on Cisco WAAS. The software works in any WAN configuration, and it acts as a single-sided optimizer to cache HTTP traffic in the absence of a WAAS head-end. Cisco recommends, but does not require, deploying both technologies (Akamai Connect and symmetrical WAAS optimization) together.
The HTTP object caching added by Akamai Connect can provide up to 100 percent WAN offload after the first pass. Akamai Connect complements Cisco WAAS byte level caching and de-duplication software, and adds the following features and benefits:

- **Transparent caching:** Offloads HTTP traffic from the corporate intranet or the Internet by caching HTTP objects near the user. Cache commonly used Internet or intranet sites or software updates like Apple iOS updates.
- **Akamai Connected Cache:** Cache content from Internet sites accelerated by Akamai—up to 30 percent of all Internet traffic—which would not be cacheable with other caching technologies.
- **Preposition HTTP sites:** Utilizes off-peak hours to preposition URLs at the customer site. Use cases include employee training, digital signage, curriculum, point of sale catalogs, software updates (roadmap), and websites.
- **Cache content with dynamic URLs such as YouTube:** Offloading of YouTube traffic can be a substantial improvement in WAN congestion. Additionally, customer business use of YouTube has increased substantially and the ability to deliver this content to sites with small WAN pipes in HD very quickly resonates across many verticals.

**Why Cisco?**

Cisco IWAN-aaS allows communications service providers to create and monetize offerings with far greater value to the end customer than pure bandwidth. Because the essential capabilities are integrated into Cisco routers, they are simpler to procure, deploy, and manage than competitive offerings based on adding hardware or software appliances, probes, or agents.

**For More Information**

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