

The Intelligent WAN: Orchestrate Change from a Central Location

What You Will Learn

Many businesses are revisiting their WAN strategies. They are looking for ways to reduce costs and improve performance using alternative connections like the Internet, 4G, and other hybrid WAN options. But regardless of the deployment model, an intelligent wide-area network (IWAN) solution has four components:

- Transport independence
- Intelligent path control
- Application optimization
- Highly secure connectivity

This white paper describes these components as well how to manage the network and its application from a central location.

The benefits of deploying new services in an existing network are often overshadowed by the perceived operational difficulty of introducing change without disrupting the production environment. To address these challenges, IT needs the ability to orchestrate change from a central location across all network elements. This is the ultimate goal.

Background

For many organizations, branch locations are no longer just outposts. They are critical hubs for everyday operations and the place of work for most employees. They are also often the locations where businesses, from retail to hospitality to healthcare and more, interact with customers or guests. Today, an organization's overall productivity can hinge on its ability to support remote offices effectively, but several dynamics make it challenging for IT to help users at the branch experience highly secure and optimized network and application performance.

Given these dynamics, it's not surprising that the benefits of deploying new services in an existing network are often overshadowed by the perceived operational difficulty of introducing change without disrupting the production environment. To address these challenges, IT needs the ability to orchestrate change from a central location across all network elements. This is the ultimate goal.

The Intelligent WAN

The Internet is quickly becoming a viable supplement or alternative to premium WAN connections because it offers faster speeds at lower cost, so organizations can increase bandwidth dramatically while also realizing meaningful cost savings. In fact, nearly half (46 percent) of organizations are planning to transition to Internet connections as early as within the next six months.¹ Other organizations have found that Internet links are required for successful rollouts of mission-critical software-as-a-service (SaaS) applications like Microsoft Office365.

¹ Source: Nemertes, *Benchmark 2012-2013 Emerging WAN Trends: The Internet Arises*.

As a result, many customers are in the process of transitioning from a single or dual MPLS WAN to a hybrid or even an all-Internet WAN. These options are illustrated in Figure 1.

Figure 1. Transport-Independent WAN Designs

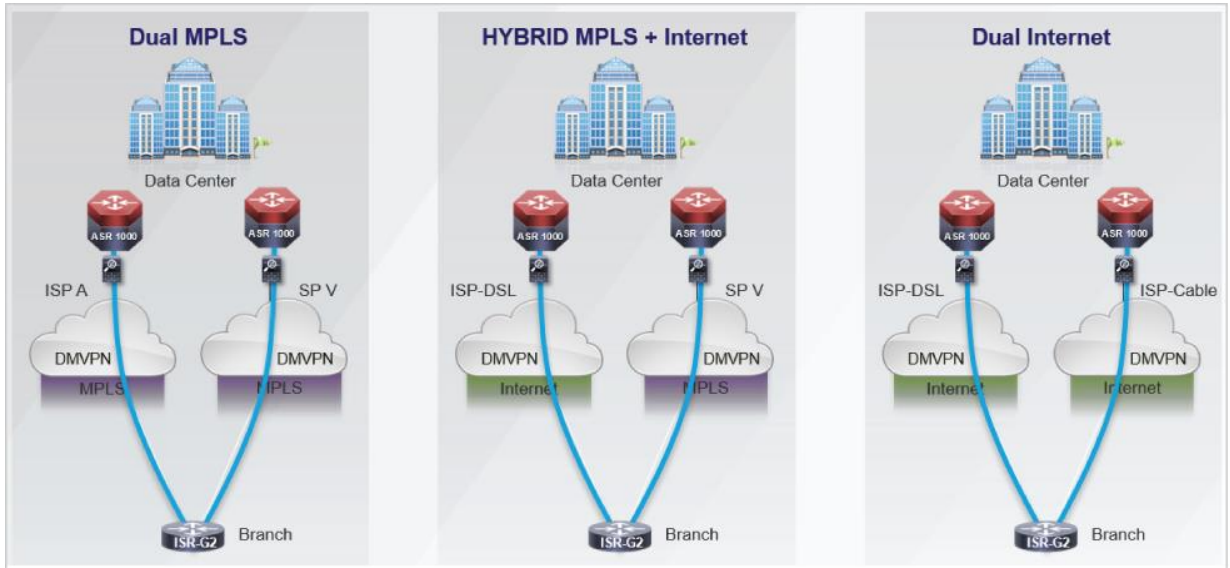
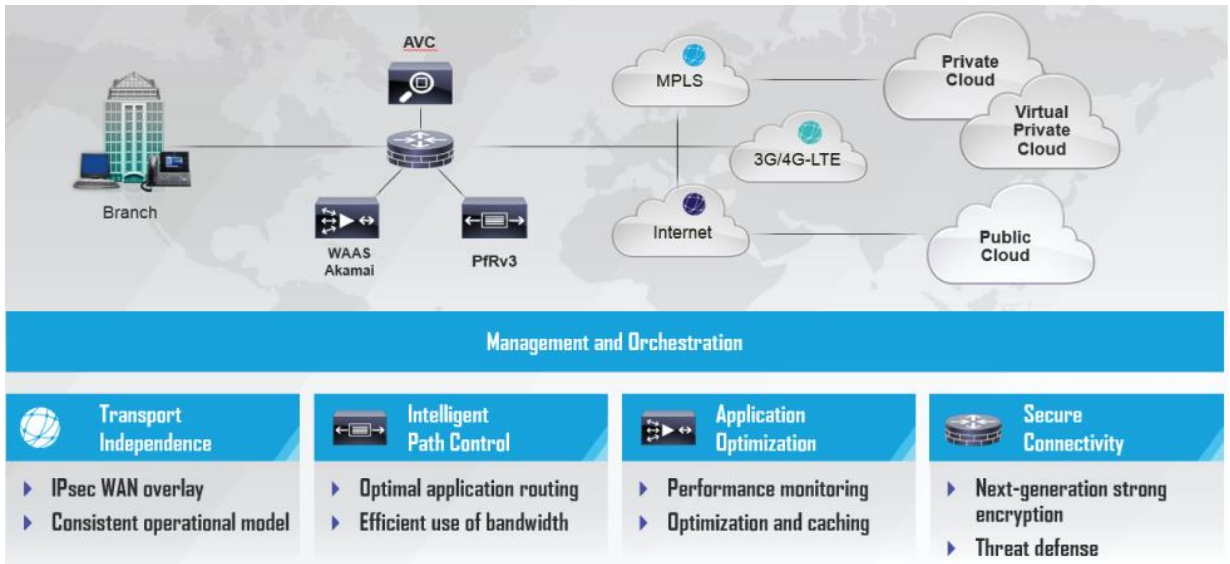


Figure 2. IWAN Solution Components



As shown in Figure 2, the four solution components required to achieve an IWAN are:

- Transport independence:** An IWAN enables WAN transport independence, giving IT the flexibility to move to alternative and less expensive transport options when needed. Essentially, it fully virtualizes the WAN without compromising performance, reliability, and security. IT can offload traffic to the Internet efficiently while scaling security to protect all branch endpoints. To deliver highly secure WAN transport independence, Cisco implements Dynamic Multipoint VPN (DMVPN) and delivers highly secure automated trust with the public key infrastructure (PKI).

- **Intelligent path control:** An IWAN helps IT to use WAN investments fully and avoid the oversubscription of lines. Intelligent path control enables performance routing (PfR), which makes routing decisions dynamically based on application type, policies, and dynamic link metrics such as latency, jitter, and packet loss. Growth of new cloud traffic, guest services, and video can also be easily load balanced across multiple lines.
- **Application optimization:** IWAN gives IT full visibility and control at the application level (Layer 7) through application visibility and control (AVC) technologies like NBAR2, Cisco® NetFlow, and quality of service (QoS). This allows IT to determine what traffic is running across the network, tune the network for business-critical services, and resolve network issues quickly. To reduce any WAN burden, IWAN also uses Cisco Wide Area Application Services (WAAS) to apply advanced compression and deduplication to help applications perform better with the smallest load possible.
- **Highly secure connectivity:** An IWAN gives IT the ability to defend the WAN intelligently by deploying robust VPN tunnels with encryption as well as integrated firewall capabilities and cloud-based web security. DMVPN can simplify connections across all sites and users to deliver high performance with high security. The Cisco Cloud Web Security (CWS) connector brings branch traffic directly to the cloud for web filtering and antimalware services.

IWAN GUIDING PRINCIPLES

These are the guiding principles of IWAN: The Cisco IWAN is a use-case driven solution. It is defined and bounded by its feature interoperability. It targets 80 percent of the market with a prescriptive approach where customization is possible, but undertaken at the customer's risk.

Less customization means:

- Automating deployment and operation is simpler.
- Feature combinations and permutations are bounded, so cross-product feature interactions are limited.
- The "bounded" scope means that engineers can focus on system quality and design.
- Less risk means better quality.

With less customization, the solution is also kept "inside the box" where simplification is more important than customization.

Cisco IWAN Management Solution Options

What is Cisco IWAN management? It is IWAN management based on business intent. It relies on pre-tested configurations. Policy creation is based on autodiscovery and a recommendation engine, where the user manages by exception to the rule of recommendation.

The IWAN management experience that Cisco aims to deliver is based on user-first principles, illustrated in Figure 3.

Figure 3. User-First Principles



Cisco's approach to IWAN management is simple, centralized, and automated. It provides options for various customer paradigms (see Figure 4).

Figure 4. IWAN Management Approach



It starts from business policy, not device. It is also centered on application performance, not network management.

Cisco provides comprehensive management options to help organizations achieve the full benefits of the Cisco IWAN experience. This includes Cisco Prime™ Infrastructure for on-premises management, either stand-alone or integrated with LiveAction for advanced visualization of application performance metrics. It also includes Glue Networks for cloud-based and multitenant software-defined WANs.

Cisco covers all Day 0 (design and prepare), Day 1 (install and make operational), and Day 2 (monitor, optimize throughout, troubleshoot) activities. See Table 1 for details on how the lifecycle operation with sites varies for different customer segments.

Table 1. Operating Context for IWAN: Key Customer Segments

	Day 0	Day 1	Day 2
Enterprise	<ul style="list-style-type: none"> • Define branch types • Network design • Configuration creation • Lab tests • Ordering 	<ul style="list-style-type: none"> • Bulk deployment • Technician on site (in some cases) • Deployment validation • Most cases required on premises, some are open to cloud 	<ul style="list-style-type: none"> • Monitoring of the network and services • Monitoring of application performance • High-level dashboard for status and proactive monitoring • Troubleshooting of network and application issues
Commercial	<ul style="list-style-type: none"> • Ordering 	<ul style="list-style-type: none"> • Device by device deployment • Open for public cloud management • No technician on site • Minimal deployment validation • May be installed by a small partner 	<ul style="list-style-type: none"> • May be managed by partner or managed service provider (MSP) • Only reactive monitoring
Service provider	<ul style="list-style-type: none"> • Long process, which includes certification • Fixed workflows and profiles • Fixed designs • Ordering based on catalog • Virtual services 	<ul style="list-style-type: none"> • No technician on site (or Level 1 telco technician) • Bulk deployment and site by site • Services chaining or packages • Hosted management at service provider or cloud • Deployment validation 	<ul style="list-style-type: none"> • Multitenant monitoring system per customer • Ticketing system • Monitoring of the network and services • Monitoring of application performance • High-level dashboard for status and proactive monitoring • Troubleshooting of network and application issues • Usage/billing reports




Let's now cover the IWAN management options, described in more detail in Table 2. Cisco offers three options for IWAN management:

- Tested configurations and load in an existing management tool
- Provisioning and management through Cisco Prime Infrastructure

- Cloud-based or multitenant option: Glue Networks

For additional and comprehensive application visualization and troubleshooting, add LiveAction.

Table 2. Cisco IWAN Management Options

Cisco Traditional on Premises	Cisco Future: Controller Based, Business Intent Centered	Third Party
<ul style="list-style-type: none"> • Built on traditional model, evolving policy, and automation • Fully enterprise-controlled • Open to combination of tools: CLI, Cisco Prime Infrastructure, homegrown • Lifecycle visibility across WAN, LAN, data center, computing system • Ready to use • Guided workflows for IWAN 	<ul style="list-style-type: none"> • SDN automation approach, programmability if desired • Fully enterprise-controlled • Unified policy-driven approach: ACI for WAN • Application-centric design • Network policies auto generated from business intent 	<ul style="list-style-type: none"> • “Easy button” engages features for visibility, automation with defaults. Automation from the cloud or multitenant (Glue Networks). • Highly visual, intuitive GUIs with advanced visualization of application path and performance (LiveAction). • Can coexist with other tools for device-level management • Forward-looking integration with APIC-EM
Cisco Prime Infrastructure	APIC-EM IWAN APP	Third-Party
		

Cisco Prime Infrastructure Overview

Cisco Prime Infrastructure helps simplify branch router deployment. It is a “one management” solution for wireless and wired lifecycle management and application visibility (see Figure 5). It brings device management capabilities into operational monitoring workflows to empower IT departments to manage the network, as well as the services that the network delivers, more effectively.

Figure 5. Cisco Prime Infrastructure



Cisco Prime Infrastructure features a “zero touch” application that allows employees without command-line interface (CLI) skills to connect, from the branch location, a Cisco Integrated Services Router, Generation 2 (ISR G2) or ISR 4000 router with a plug-and-play solution using an Apple iOS app or a USB stick bootstrap. (“Plug and play” products work as soon as they are active in the network.)

The branch router deployment process begins when the administrator creates a plug-and-play device profile in Cisco Prime Infrastructure, specifying the device name, desired configuration, software image, and if desired, the device serial number. A deployment PIN is generated for the device and emailed to the installer. After receiving the

device, the installer at the branch location connects the appropriate cables, launches the plug-and-play application, and enters the PIN. The application registers the device serial number with Cisco Prime Infrastructure and downloads bootstrap configuration to the device. The device then downloads the software image and full configuration from Cisco Prime Infrastructure. The plug-and-play application displays the status.

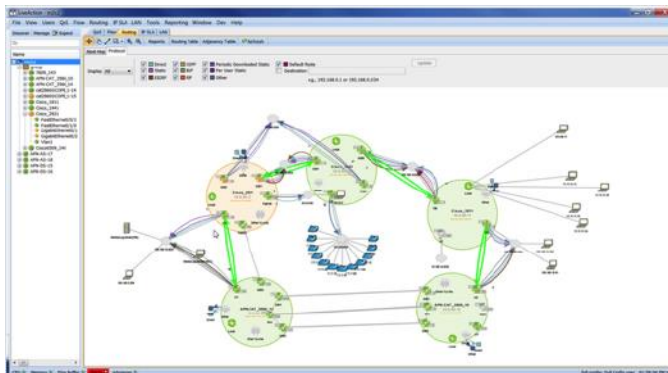
Cisco Prime Infrastructure Prime also provides IT with a global view of network health and performance, including the overall application experience in the network, including WAN, data center, and campus. It also serves as a system of record because it keeps track of all network elements and their configuration details across the network—and across the campus and data center.

In addition, Cisco Prime Infrastructure will deliver out-of-the-box IWAN workflows for a guided experience in deploying IWAN in brownfield scenarios.

Cisco Prime Infrastructure plus LiveAction Overview

Organizations that want on-premises IWAN management with intelligent path control enabled and a tool that provides network situational awareness should consider using Cisco Prime Infrastructure integrated with LiveAction (formerly ActionPacked; see Figure 6).

Figure 6. LiveAction



LiveAction provides application-aware network performance management and QoS control for Cisco IWAN. Its GUI offers end-to-end flow visualization of the network: a “single pane of glass” view that includes key WAN interfaces. Using LiveAction, IT can access real-time visualization of application paths, and quickly identify issues and take corrective action to optimize both application and network performance. LiveAction also provides IT with the ability to visualize and track QoS performance, classification, and congestion on the fly and validate changes immediately. Additionally, with just one click, IT can create a QoS audit report for every QoS policy on the network.

LiveAction provides full visibility of PfR path changes across network topology, along with the reasons for those changes, which helps to justify return of investment for IWAN implementation—and can lead to increased IWAN adoption.

Glue Networks Overview

Glue Networks leverages Gluware, a cloud-based, multi tenant provisioning and change management engine for IWAN. Specifically, Gluware utilizes policy-based configuration and orchestration along with intelligent communication to supported IOS devices. This enables Glue Networks to quickly and easily provision and manage your entire Enterprise WAN with assurance and certainty (see Figure 7).

Figure 7. Glue Networks



Glue Networks automates the building of WANs, so your branch and remote office provisioning is accelerated and free of errors. Because IWAN can be orchestrated and deployed out of a cloud engine across branches, there is no need for organizations to install complex, on premise software in their data centers. They can leverage Gluware as a Service to enable their IWAN. Organizations with lean or outsourced IT teams can especially benefit from the use of Gluware for IWAN management. Gluware can automate and orchestrate the Cisco ISR G2, ASR 1001/1002, virtual CSR and new 4400 series routers.

In addition to seamlessly enabling transport independent, DMVPN architectures, Glue Networks implements PfR and QoS. Organizations can intelligently use their WAN networks by specifying Path Control for their applications. For example, IT can set and easily change criteria for automatic failover if traffic for an application policy threshold is breached. Once the application policy traffic is back in normal range, traffic will resume its original path based on business policy.

IT also can access a holistic view of the network's real-time status, create and manage device groups, receive alerts, monitor key performance indicators, and facilitate the network device provisioning process through Gluware's highly visual dashboard.

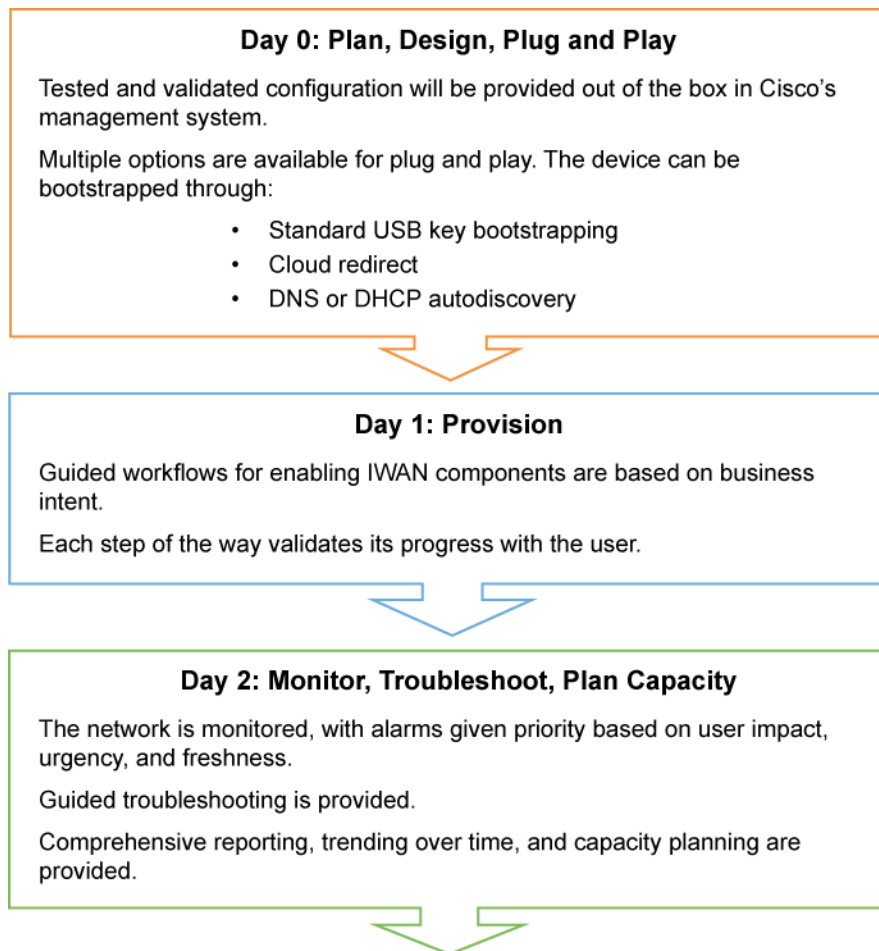
A Look Ahead

As part of our effort to embrace the emerging application-centric infrastructure, Cisco will soon be introducing another IWAN management option. It will allow organizations to enable the four key components of IWAN and realize the full benefits of using the Internet for WAN transport.

This is an architecture based on open interfaces, a software-defined networking (SDN) services plane, and device layer abstraction. This approach will allow full policy-driven deployment and operation of the IWAN network. Cisco Prime, LiveAction, and Glue Networks tools will become “apps” that run on top of this infrastructure. Organizations will be able to preserve their investment in training, automation, and operation workflows. Watch for more information about this in the near future.

Further simplification is what Cisco strives for, as described in Figure 8.

Figure 8. Simplified Approach for Day 0 Through Day 2 IWAN Management



For More Information

For more information on Cisco IWAN, go to <http://www.cisco.com/c/en/us/solutions/enterprise-networks/intelligent-wan/index.html>.



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