

# Cisco: Leading the Way to Borderless Networks

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We work, live, play, and learn in a world that has no boundaries and knows no borders. We expect to connect to anyone, anywhere, using any device, to any resource—securely, reliably, transparently. That is the promise of [borderless networks](#).

In order to fully deliver on this promise, Cisco is advancing along three critical fronts: workplace transformation, technology leadership, and operational excellence.

## Workplace Transformation

“For business leaders an opportunity is being presented to break with the status quo of being confined to a single perimeter or break away and embrace technology trends that increase customer experience and lower operational cost by opening up to new perimeters of location, devices and applications securely and reliable with a **Borderless Network**.”

—Nick Lippis, *The Lippis Report*

The new workplace is visual, mobile, and in the moment. And for the end user, the quality of the experience is everything. Network service levels are judged purely by the quality of this “customer” experience. And remember, this “customer” could be running any application, in any location, from any device. And in this borderless world, this “customer” might be internal workers, business partners, or external end customers.

Here, the network must respond to onrushing video traffic demands; meet the rising expectations of an increasingly mobile user population; and last, but not at all least, deliver the best possible user experience.

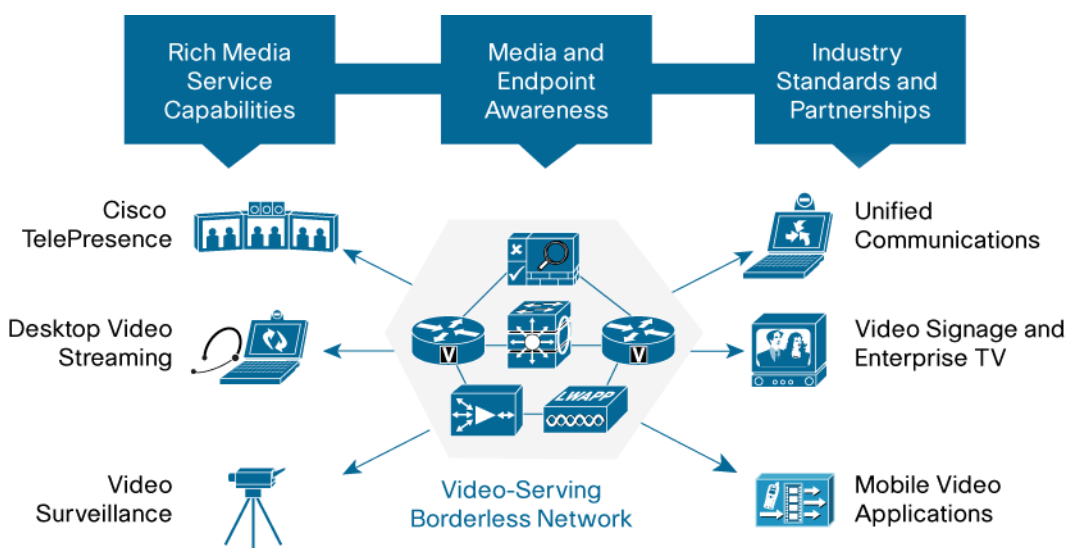
Let us examine this workplace transformation and how Cisco is working to accelerate technology advancements and customer success along this front.

## The New Workplace Is Visual

Video promotes high effect in business and applies high pressure on the network. And video is growing dramatically across all networks, big and small, local and global, public and private. For example, 65 percent of the traffic on Cisco's internal network is video, and that figure is climbing.

[Medianet](#) capabilities (Figure 1) help ensure that your network not only delivers a high-quality video experience to the end user when needed, but also helps ensure that your network is ready for onrushing video demands and applications. Built-in intelligence offers adaptability and predictability, reliably and transparently providing high-quality media experiences to any device on the network. With medianet, your borderless network optimizes traffic flow and bandwidth utilization, while reducing the effect of network congestion. And it does all this while lowering the complexity and risk associated with video rollouts.

**Figure 1.** Cisco Medianet: Delivering a Quality Video Experience



Cisco's medianet solution is further bolstered by primary networking services such as multicast, quality of service (QoS), and mobile [VideoStream](#). These primary services, combined with such critical built-in switch and router device capabilities as port buffering and video streaming, are put to effective use by a broad range of video applications, ranging from the interactive Cisco TelePresence™ conferencing and Cisco WebEx® conferencing to the one-way IP video broadcast or distance learning session.

Cisco IT's video delivery experience, proven network engineering practices and designs, specialized support services, and an extensive ecosystem further heighten the positive effect of business video within borderless networks. [Cisco Validated Designs](#) and public cloud-based services from Cisco and service provider partners are offered in support of the specific needs of customers.

## The New Workplace Is Mobile

The rapid proliferation of mobility devices, users, and applications raises the stakes in wireless scalability, security, and support requirements.

Radio frequency (RF) interference is a [growing concern for organizations](#) deploying indoor and outdoor wireless networks. Left unaddressed, RF interference can result in low data rates and throughput, lack of sufficient WLAN coverage, WLAN performance degradation, poor voice quality, and low end-user satisfaction. These factors in turn can lead to decreased network capacity, network downtime, and potential security vulnerabilities from malicious interference. Cisco offers industry-leading RF management capabilities in its mobility solutions. Cisco technologies

such as [ClientLink](#), [Spectrum Intelligence](#), [CleanAir](#) (Figure 2), and VideoStream help ensure clear and efficient communications at all times, even when faced with crowded airspace and video delivery demands.

**Figure 2.** Benefits of CleanAir Technology

Benefits	Features
 <b>Self Healing and Optimizing</b> Reduces Downtime, Maximizes Resilience	<ul style="list-style-type: none"> <li>• AirQuality Aware RRM</li> <li>• Event Driven RRM</li> <li>• Persistent Device Avoidance</li> </ul>
 <b>Troubleshooting Forensics</b> Lowers Problem Resolution Time/Cost	<ul style="list-style-type: none"> <li>• Remote Client Troubleshooting</li> <li>• Spectrum Expert Connect</li> <li>• Location, Impact Analysis and History Playback</li> </ul>
 <b>Wireless Security</b> Improve Visibility to New Threats	<ul style="list-style-type: none"> <li>• New Rogue Threats Detection (off-channel, inverted)</li> <li>• DOS Jammer Detection</li> </ul>
 <b>Policy Enforcement</b> Enables Enforceable Rules	<ul style="list-style-type: none"> <li>• Unwanted Device Notification</li> <li>• Unwanted Device Location</li> </ul>

With rising demand for connections and increased traffic volumes, mobility solutions that readily adapt to meet new service demands are of high value. Cisco offers superior scalability and service intelligence in wireless networks. For example, Cisco's [802.11n](#) product portfolio combined with 802.11n design and support services is evidence of Cisco's impetus to boost performance, while easing adoption of new mobility capabilities. Cisco's context-aware capabilities and strong security services are yet other areas of mobility leadership.

The Cisco Borderless Networks Architecture also calls for increased integration of wired and wireless networks. From an architectural viewpoint, you operate only one network, with this one network offering many connectivity options for users and resources. Here, Cisco offers physical integration using WLAN controllers based on Cisco Catalyst® switches and integrated services router (ISR)–based WLAN access points. Integration is further heightened through the consolidation of wired/wireless security systems and policies, enabling access and user protection no matter the connection.

### The New Workplace Is in the Moment

Application-layer traffic controls within the network work to help ensure consistent response times and “always-on” access. QoS, Network-Based Application Recognition (NBAR), Network Analysis Module (NAM), and Programmable IP Services Accelerator (PISA) technologies are just some of the primary technologies Cisco provides in support of the quality application experience. Each provides its own unique boost to the customer experience.

For remote and branch offices, Cisco's Wide Area Application Services ([WAAS](#)) solution optimizes applications across the WAN. Offered as both a standalone solution and one that is integrated with Cisco ISRs, WAAS minimizes WAN traffic volumes, supports efficient content delivery and user exchanges, and enables new remote systems such as video kiosks. Most importantly, WAAS provides for a first-class application experience to the remote user. Given that this remote user can often be a worker interacting with end customers or an actual end customer interacting with online transaction systems, a good experience translates directly to heightened customer satisfaction and, likely, repeat and referral business.

Taking application optimization one step further are Cisco solutions aimed at supporting applications within the network itself. This not only improves the performance of applications, but also helps minimize the complexity associated with deploying and operating network-based applications. The Cisco ISR hosts applications using its [Application eXtension Platform](#) (AXP), an internal service module for the ISR. The Cisco ASR serves as a web

conference manager using its [WebEx Node](#) service module. The aim of these network-hosted applications is to help ensure the effective and efficient delivery of premium service, no matter what the location or application.

As stated previously, network service levels are judged purely by the quality of the “customer” experience with any and all networked applications. No borders. No limits.

## Technology Leadership

“The integration of the network with business processes and applications requires that organizations treat the network as a holistic entity by taking a systems approach.”

—Zeus Kerravala, Yankee Group

Let us now turn our attention to technology leadership within the network infrastructure itself. In this always-on, ever-connected borderless world, leadership in networking is a critical success factor for all organizations. And no longer is the network judged as a tactical IT-serving utility. Now, it is judged even more critically as a strategic business resource.

Primary questions to ask include: How does the network best deliver rich and consistent services? How does the network best protect connected resources and users? And finally, how does the network best adapt to new business demands and absorb new technology advancements? Let us answer each of these three primary questions now.

### The Network Best Delivers Using a Systems Approach

The network is a critical business system, with many components required to work as one.

Extensible systems and integrated services combine to multiply the value of the borderless network. Cisco’s wide-ranging portfolio allows freedom of choice for the customer. Designed-in hardware assists and a wide range of network and service modules help ensure that the network not only delivers rich services, but also provides consistent performance when services are turned on. The [Cisco ISR](#), with its extensive services capabilities, serves as a prime example here. Embedded hardware assists for voice, video, and security processing heighten ISR service capabilities and service quality.

Consistent services and common components also enable cost savings and operational efficiency. Cisco IOS<sup>®</sup> Software provides a common software base across routing and switching systems. Common sparing and component reuse protects your investment as you expand and enhance your network. The [Cisco ASR](#) and ISR serve as good examples here. By design, the Cisco ASR makes use of Shared Port Adapters (SPA) already in use in customer networks. The recently announced Cisco ISR G2 makes use of network and service modules designed for the original Cisco ISR series.

The [systems approach](#) also delivers operational efficiency. Management expertise, policies, and practices can be applied across the network. Routine tasks and problem handling can be automated using such primary features as command-line interface (CLI) scripts, Embedded Event Manager (EEM), and Generic Online Diagnostics (GOLD). Further consolidation and control are enabled through centralized management facilities such as the [CiscoWorks LAN Management System](#) (LMS) and [Cisco Wireless Control System](#) (WCS).

## The Network Best Protects Using Integrated Security

Secure access to the network and networked resources is certainly a primary area of concern for all organizations in this Internet age. Security threats come from every direction and are ever changing. Protecting the network—no matter the angle of attack—is a must for every organization. In many industries, it is even a regulatory requirement.

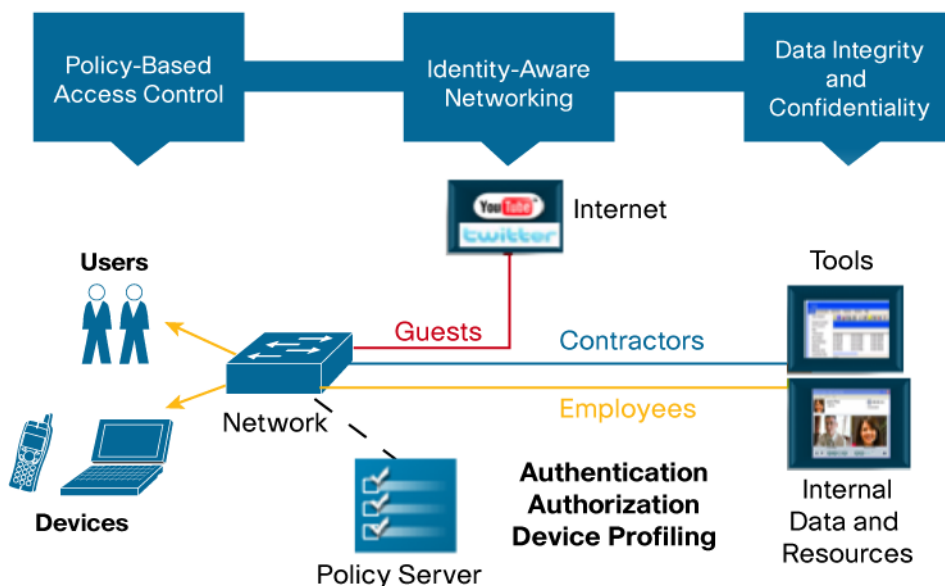
Given that threats appear in many forms and along many fronts, it is vital that security mechanisms provide blanket coverage for your network and networked resources. Do you lock all your doors when you leave for vacation? Or just some of them? Blanket coverage requires that security services be in operation across the network infrastructure at all appropriate points of potential attack.

And while these mechanisms must provide for maximum protection, they must also minimize their effect on network service levels. Protection should not sacrifice performance. And performance should not sacrifice protection. Here, Cisco's systems approach, described earlier, bears fruit using integrated security services. Networking platforms that are optimized to run security services allow you to “turn on” security without reducing network service levels.

To further ease the effect of security across the network, central policies and consistent management interfaces allow the network operator to enforce security without having to commit to micromanaging security functions and secured users and resources. Here, what is crucial is balancing effective security enforcement with efficient security administration. The goal: Provide full protection for your network and full productivity for your support staff.

[Cisco TrustSec](#) (Figure 3) serves as a good example of an effective and efficient security service at work across the borderless network. TrustSec dynamically assigns access and services for users and devices and helps ensure that endpoint devices are authorized and healthy using consistent, network wide security policy enforcement. TrustSec also helps address compliance requirements by providing access control to sensitive and valuable information and assets, collecting user activity and history data, and providing end-to-end monitoring and reporting capabilities.

**Figure 3.** Cisco TrustSec: Secure Access to the Network



Beyond TrustSec, Cisco further strengthens your security stance across many critical—and vulnerable—fronts. For example, [Cisco AnyConnect](#) extends access security to mobile users and their device of choice. The [Cisco Virtual Office](#) provides a complete teleworker solution, enabling full productivity and protection for the remote worker. Other security solutions target such primary requirements as [threat defense](#), [data loss prevention](#), and [PCI compliance](#).

When securing your network, it is also vital to remember that success is as much determined by solid processes as it is by strong products. Cisco's superior portfolio of security support services runs the gamut from assessment to deployment to optimization to ongoing remote operations. In addition, Cisco provides for proven secure network designs using [Cisco's Design Zone for Security](#), a wealth of security guidance and resources using [Cisco Security Center](#), and rapid reaction to threats using [PSIRT advisories](#).

In this connected age, you must provide the most freedom and greatest flexibility for your users. At the same time, you must exercise absolute control over connected resources and everyone who wants to use and abuse these resources.

## The Network Best Adapts Using Continual Innovation

In today's world, continual network innovation is vital to achieving IT and business goals.

Cisco spends \$5+ billion in annual R&D on the network. Worldwide, 30 major labs and 20,000 engineers are dedicated to network technology and product development. This focused and unmatched level of investment assures that Cisco not only maintains its industry leadership stance, but also, more importantly, helps ensure the success of Cisco customers looking to get the most out of the network and their networked users and systems.

Evidence of this effort can be seen along two critical fronts: network standards and network service intelligence. Cisco has been at the forefront of promoting the advancement and adoption of industry standards. Standards pioneered by Cisco read like a Who's Who in networking technologies: Fast Ethernet, Power over Ethernet, Session Initiation Protocol (SIP), Control and Provisioning of Wireless Access Points (CAPWAP), and Multiprotocol Label Switching (MPLS), to name a few. ([See white paper.](#))

Cisco is also at the forefront of promoting intelligent networks. Security, mobility, application networking, voice, video, network automation, and now even energy management all extend the capabilities and business effect of the network. These intelligent services are core to the Cisco Borderless Network Architecture. And they are core to the innovation that Cisco delivers to the network and to customers.

Witness the future unfolding within our [IPv6 capabilities](#) or our strong [802.11n portfolio](#). Witness the sustainability gains offered by [Cisco EnergyWise](#) and Cisco Virtual Office. Customers are saving money and promoting sustainable business practices by controlling their energy consumption and making the best use of their facilities.

## Operational Excellence

"For most enterprises, networking budgets are dominated by carrier and staffing/outsourcing costs, which together comprise about 80% of the total. Hardware, software, maintenance services, occupancy, and a small percentage of unallocated costs make up the remainder."

—Jay E. Pultz, Gartner

Finally, let us turn our attention away from systems and technology and focus on operational excellence. How does one take all this advanced technology and effectively and efficiently respond to all the user and business demands that accompany this brave, new borderless world? After all, even the richest and "rightest" technology solution will fall short of expectations if it is not bolstered by (1) a proven set of best practices, (2) a strong support structure, and (3) an accurate and complete view of network costs and value.

Let us examine each of these primary operational components.

## Best Practices and Borderless Networks

In today's connected world, business systems and processes are built to take advantage of the network. And just as business systems and processes are unique to individual customers, so too are their networks. Special network service requirements can be dictated by customer business model, or industry pressures, or geographic location, and on and on.

At a business level, Cisco functions as a strategic partner. Industry experts advise customers on networking norms and trends. This advice can target a specific vertical industry such as healthcare or government. Or it can take aim at horizontal business functions such as remote collaboration or customer care. Cisco backs up this advice with networking solutions that get Cisco industry solutions up and running quickly. Examples include [PCI for Retail](#), [Medical-Grade Network 2.0](#) for healthcare, and [Citizen Connect](#) for governments.

At a technical level, Cisco provides IT and network staff with expert analysis, proven designs, certified training, and technology management best practices. Cisco's [Design Zone](#) and the [Cisco Security Center](#) serve as two prime sources of in-depth technical guidance. Cisco makes sure you do networking right from the start. Here, the breadth and depth of technical guidance offered to customers are unmatched in the industry.

In addition, Cisco leads by example. Cisco IT has long been recognized as a leader in supporting the networked organization. Cisco's internal expertise and experience are passed on to customers, enabling them to learn from Cisco successes, and yes, Cisco trials and errors. Cisco is also recognized for its leadership in green IT practices. Teleworking, remote collaboration, and resource virtualization all have strong influence within Cisco. And for those customers looking to take advantage of developing cloud services, Cisco is an active provider ([WebEx collaboration cloud](#)) and partner with cloud service providers.

Cisco works hard to make sure you do networking right.

## Support Services and Borderless Networks

The strength of network support services, whether you are looking at your own internal offerings or those of your technology providers, is a prime determinant of networking success. From design to deployment to operations to innovation, how well you support your business and your end users determines how successful you are in networking. This is not to say that technology or solutions or products do not matter. They do. What this says is that support service excellence leads you to use the right solutions and then use them most effectively and efficiently.

Cisco offers a wide range of services options. This allows customers to best balance their support requirements with their support budget. Cisco's enhanced [limited lifetime warranty](#) (LLW) reduces maintenance costs, while still providing solid support. Above and beyond the LLW, Cisco offers a wide range of services options, from basic (for example, [Smart Foundation](#)) to premium (for example, Cisco [SMARTnet](#)<sup>®</sup> Service and [Smart Care](#)) to advanced (for example, Security Assessment and UC Migration). Cisco will even co-manage your network through our [Remote Management Service](#) (RMS).

Customers are provided further flexibility through Cisco direct and online service capabilities. Both Cisco's Technical Assistance Centers and web-based support resources are award winning. No one supports networks like Cisco.

In order to optimize support for borderless networks, Cisco also offers a single service contract that covers the core technologies within the Cisco Borderless Network Architecture: routing, switching, security, and mobility. For example, Cisco's [Network Optimization Service](#) encompasses all four of these core technologies, allowing Cisco to optimize your borderless network as one single business system.

Whatever your preference in service levels or service delivery methods, you can rest assured that, with Cisco, you are receiving the best support available in the industry. No other vendor comes close to offering five global TACs and more than 1500 support engineers dedicated to network support. Additionally, as you look to staff your own IT organization, the more than one million network technicians certified by Cisco (growing at 10 to 15 percent annually)

represent a huge source of talent from which to draw. Combined, Cisco's resources and your resources help ensure that your network and your organization overall are provided the best possible service and the best possible service levels.

### **Cost Savings and Borderless Networks**

Operating expenses typically account for 75 to 80 percent of the networking budget. It makes sense that operational efficiency promotes the greatest network-related cost savings. That does not mean that capital expenses should be ignored. You must save wherever you can. Beyond network-related capital expenditures (capex) and operating expenses (opex), you should also be mindful of costs that can be directly influenced by the network. For example, downtime results in lower productivity, customer dissatisfaction, and lost revenue. Underutilized resources result in overspending on systems and support.

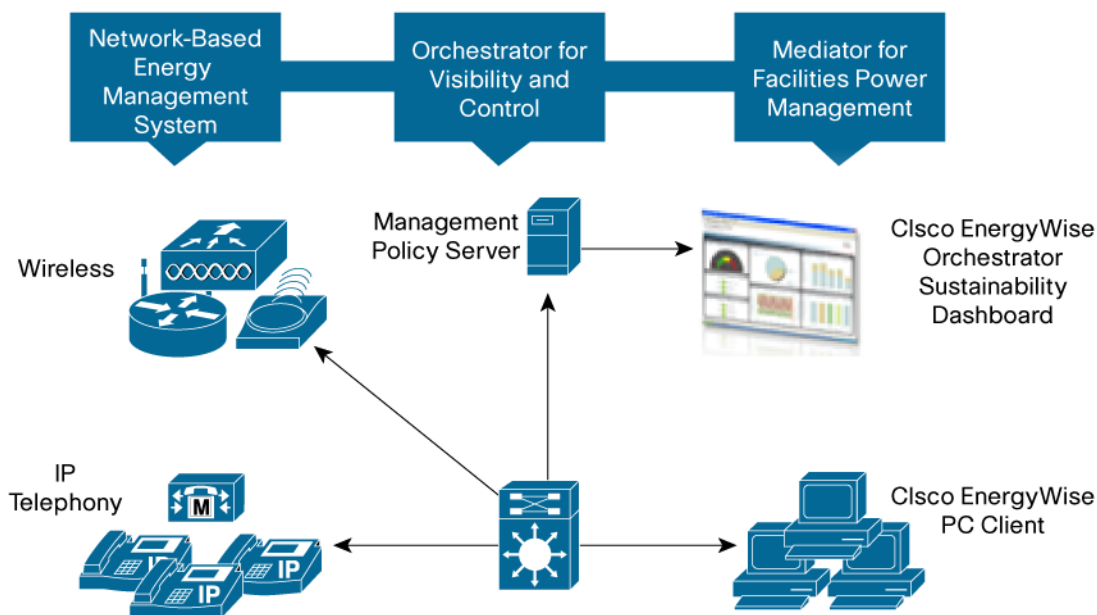
Networking devices that support multiple services (for example, connectivity, security, voice, mobility, and so on) eliminate the need for specialized devices and reduce network complexity. Service intelligence and modular designs also extend the service life of equipment, protecting your investment over time. The result: capex and opex savings.

Cisco further reduces opex through such primary capabilities as zero-touch service activation and management automation. For example, Cisco's ISR allows remote provisioning of integrated services. Cisco's EEM automates common tasks and problem handling.

Cisco's industry-leading high-availability features help avoid scheduled and unscheduled downtime. For example, [Cisco's In-Service Software Upgrade](#) (ISSU) capability allows software updates while the networking device remains in service. Cisco's [CleanAir](#) technology assures the integrity of your mobile network by actively managing wireless signals in an increasingly crowded and contentious airspace. On the security side, industry-leading products and practices help ensure your network is protected from forced downtime or slowdowns. These same security solutions also help you avoid productivity losses when users are remote or mobile. For example, [Cisco Virtual Office](#) provides for full protection and productivity for teleworkers.

Resource savings extend beyond the network through primary virtualization (for example, virtual LANs [VLANs], Dynamic Multipoint VPN [DMVPN]) and sustainability (for example, EnergyWise, Cisco Virtual Office) services. Here, reductions in IT systems, energy use, and facilities requirements promote savings across both IT and the business.

[Cisco EnergyWise](#) (Figure 4), energy management software for Cisco Catalyst switches and Cisco ISRs, also serves as a prime example of how the role of the network is expanding to promote value beyond traditional IT enablement. Cisco EnergyWise along with its [Orchestrator](#) management console and PC client software, measures, monitors, and controls power demands of a variety of networked devices (for example, IP phones, WLAN access points, PCs, and servers). Cisco's complementary [Network Building Mediator](#) enables heightened control over the power demands and energy costs relating to the facilities infrastructure: for example, lighting controls and HVAC systems. In the future, Cisco EnergyWise and Mediator integration combined with technology partnerships will further consolidate energy controls across the network, providing you with complete control over your organization's energy consumption and costs.

**Figure 4.** Cisco EnergyWise: Reducing Energy Costs and Consumption

Last, but certainly not least, Cisco provides for direct cost savings on equipment and maintenance through a number of primary programs. Product bundles reduce the cost of purchasing commonly grouped networking systems and components. [Cisco Capital<sup>SM</sup> Finance](#) provides flexible leasing options when customers are looking to balance capex and opex and adapt their networks as new demands arise. Trade-in allowances reduce network refresh costs and support sustainable electronic waste initiatives and directives. And, as mentioned earlier, Cisco's enhanced LLW further reduces the cost of the Cisco solution.

As you see, doing borderless networks right involves far more than picking the brightest technology, the best solution, or the least costly product. It is as much technique as it is technology.

### The Final Word

**"It's supposed to be hard. If it wasn't hard, everyone would do it. The hard ... is what makes it great."**

—Jimmy Duggan (Tom Hanks), *A League of Their Own*

One must implement on a number of fronts to achieve success with borderless networks. Users must be fully satisfied in this visual, mobile, and in-the-moment environment. Technology must be applied effectively and advanced continually. And finally, operations must be implemented efficiently, while at the same time assure service excellence. At Cisco, we will not be so bold as to say delivering on the full promise of borderless networks will be easy. We do, however, commit to making it as easy as possible and a complete success for your organization.



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