Cisco EnergyWise: Power Management Without Borders

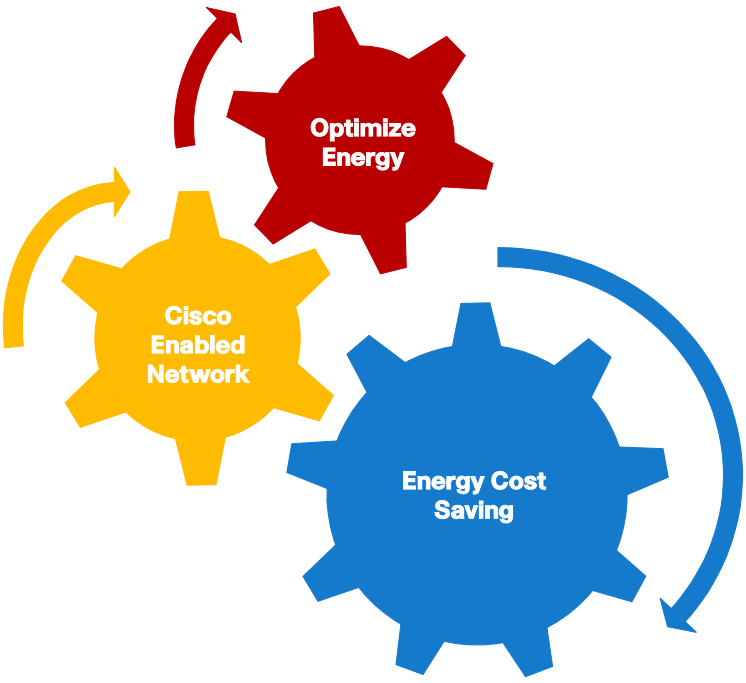
Introduction

In response to energy costs, environmental concerns, and government directives, there is an increased need for sustainable and “green” business IT operations. Methods to measure power consumption and control energy output are now the focus of businesses worldwide, with all customers looking for consolidated energy management across different device and communications media.

Cisco® EnergyWise is a new energy management architecture that will allow IT operations and facilities to measure and fine-tune power usage to realize significant cost savings. Cisco EnergyWise focuses on reducing power utilization on all devices connected to a Cisco network ranging from Power over Ethernet (PoE) devices such as IP phones and wireless access points to IP-enabled building and lighting controllers. It uses an intelligent network-based approach, allowing IT and building facilities operations to understand, optimize, and control power across an entire corporate infrastructure, potentially affecting any powered device.

This white paper illustrates how businesses can utilize Cisco EnergyWise with a network enabled by Cisco to better understand the power footprint of their organization and optimize to reduce energy costs (see Figure 1).

Figure 1. Cisco EnergyWise Optimize and Cost Saving



Traditional IT Power Management

Today many customers are focused on reducing costs related to the power consumed by IT devices in the enterprise. Normally this involves the comparison of device efficiency, power consumption, and the total number of devices needed but no other metrics. However, enterprise professionals lack a holistic means to measure the day-to-day power consumed by all network-attached devices. This problem is compounded because responsibility for building systems is provided by the traditional facilities team, which manages heating, cooling, and lighting resources. Many customers realize the cost of maintaining separate networks for the control of heating, cooling, and lighting is

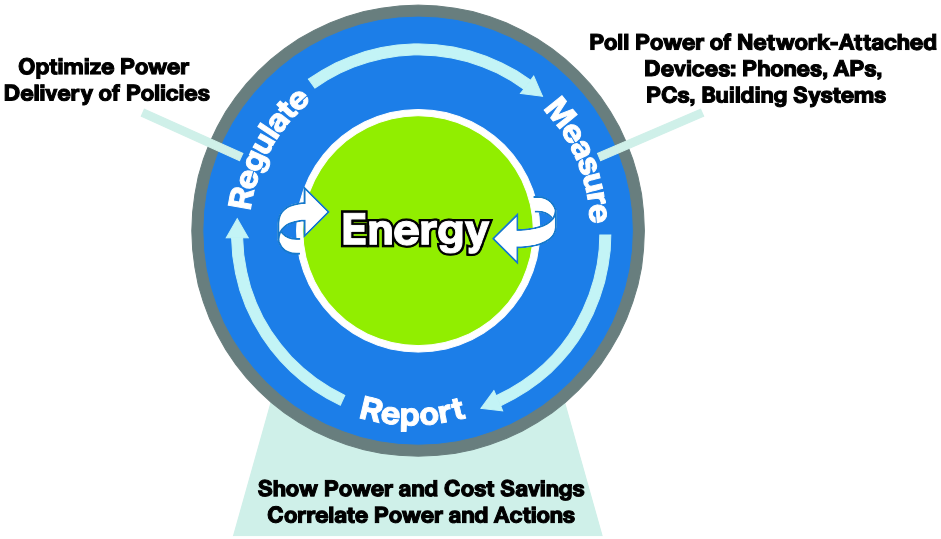
expensive, and because of this building control devices are converging to IP and utilizing the Cisco network. The interaction between the two teams typically happens when sizing the network wiring closets or when redundant power systems are implemented. Many times, wiring closets' electrical infrastructure is oversized because real power utilization of the equipment under real operating conditions is not understood. This often leads to installation of oversized uninterruptible power supplies (UPSs) and excessive cooling. This inaccurate engineering of the wiring closet increases initial deployment costs and leads to long-term inefficient operation of systems. Most customers would benefit from realistic information about the amount of power consumed by IT-related devices, including switches, routers, IP phones, PCs, surveillance cameras, and wireless access points. Cisco EnergyWise provides the IT professional a new method to understand power usage and justify energy costs.

Cisco EnergyWise Power Management

Cisco EnergyWise is an energy management architecture designed to measure power consumption and optimize power usage, resulting in effective delivery of power across the enterprise. IT professionals can quickly optimize the power consumed in a building, and the result is immediate cost saving with a clear return on investment.

Cisco EnergyWise measures current power consumption, can automate and take actions to optimize power levels, and can advise how much power is being consumed to demonstrate cost saving. After power consumption is understood, regulation using Cisco EnergyWise network protocols provides command and control of power usage. Energy consumed per location can easily be found with a realistic view of power consumed per wiring closet, building floor, or campus building (see Figure 2).

Figure 2. Cisco EnergyWise Optimized Power Delivery and Verification

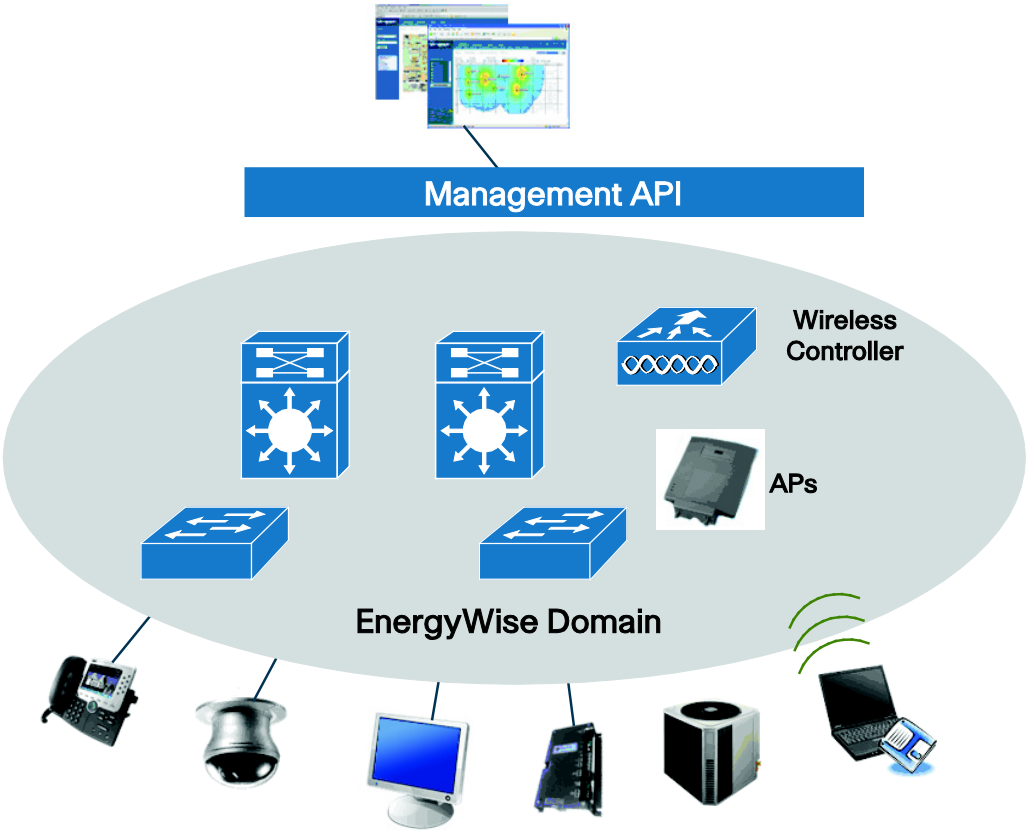


End-to-End Cisco EnergyWise Intelligence

The Cisco EnergyWise network is used to intelligently and proactively manage power consumption and consistently enforce policies to provide lower energy consumption. Cisco EnergyWise has the ability to monitor, manage, and reduce energy use by creating visibility to how electricity is consumed and create the ability to turn devices from always on to always available based on business needs. Cisco EnergyWise offers coordinated power management utilizing Cisco Borderless Networks for scalability and communication. For example, when an employee enters a building, a series of events can take place that enhance efficient building operation. An employee's badge access might trigger the office phone to power up, wireless access point coverage to be assured, computers to boot up, and temperature of the office to be brought to a proper value. As a result, the user of Cisco EnergyWise is saving energy by powering off components when they are not needed.

In many cases individual management systems are dedicated to each type of device in a building, with management systems for building controls, another for phones, and another for access points. Today a large number of systems need to be integrated together to perform coordination of events for power management. Disparate system integration is difficult to achieve and not always used. Cisco EnergyWise networkwide policies can control device power management, eliminating the need for a myriad of systems across different borders to work with each other. Coordination is a primary benefit for the above scenarios, and it is the Cisco network acting as a proxy of information that allows systems to communicate in a synchronized fashion that reduces complexity and costs, assuring power saving. Figure 3 depicts a typical Cisco network enabled by Cisco EnergyWise, including the management layer and endpoints.

Figure 3. Network Enabled by Cisco EnergyWise



Cisco EnergyWise Cost Savings

The cost savings realized by using Cisco EnergyWise are significant. In many countries saving energy for the business is mandated by the government, and proof of saving energy can provide financial incentives. As compared to today's typical campus building or branch, the savings realized by just controlling IT power devices is significant. Details on cost saving calculations related to enterprise IT DS is available using the Cisco Green Calculator on Cisco.com.

How Does Cisco EnergyWise Work?

Cisco EnergyWise gives the user a network-based framework process to discover, monitor, optimize, advise, and regulate energy needs for the business. Cisco EnergyWise encompasses a highly intelligent network-based approach to communicate messages that control energy between network devices and endpoints.

Discover

The network discovers devices that Cisco EnergyWise can manage, monitors the power consumed, and then takes actions to control the power consumption behavior. Endpoints enabled by Cisco EnergyWise can speak directly with Cisco switches and routers, communicate power utilized, and also be controlled by time-of-day policies to shed loads at certain times. The Cisco EnergyWise network protocols use a unique neighbor relationship capability to locate and inventory power consumed by devices attached to the Cisco network. The Cisco EnergyWise network protocol is similar to IP routing protocols, allowing the network to quickly find the power consumed using a networkwide approach and query mechanism. There is a parent and child relationship among devices in which one device can relay the power consumed by its neighbors. This mechanism might be useful for a heating, venting, and air conditioning (HVAC) controller reporting the power consumed by attached air handlers.

Monitor

Cisco EnergyWise uses a unique domain-naming system to query information from a set of devices, making it much simpler than traditional network management capabilities available today. There is a management interface within Cisco switches so an IT or facilities application can communicate in an intelligent manner through the network. The management interface uses a standard command-line interface (CLI), Simple Network Management Protocol (SNMP), or TCP to allow Cisco and third-party management systems a method to monitor, optimize, and regulate power of both the network infrastructure and attached devices.

Optimize

Cisco EnergyWise has the ability to apply time policies to control the power consumed. These policies can be implemented by device type, device location, priority of the device, and other parameters. A scheme of priority and power levels is available within the Cisco EnergyWise protocols, allowing fine-grained control of how endpoints react to network-based signals. The priority of the devices tells the Cisco EnergyWise system if a device should be affected by a signal to optimize the power. Highest priority devices will not shed load, and lower priority devices can be shut down or have power reduced. Power levels allow the Cisco EnergyWise system to tell the device which power state it needs to achieve. For example, the message sent by the Cisco EnergyWise management system will change low-priority devices to a level of sleep state, while IP phones with high priority may not be shut. Optimization can provide cost savings by saving energy but also by sizing wiring closets and building resources to appropriate values, giving customers long-term and short-term cost reduction.

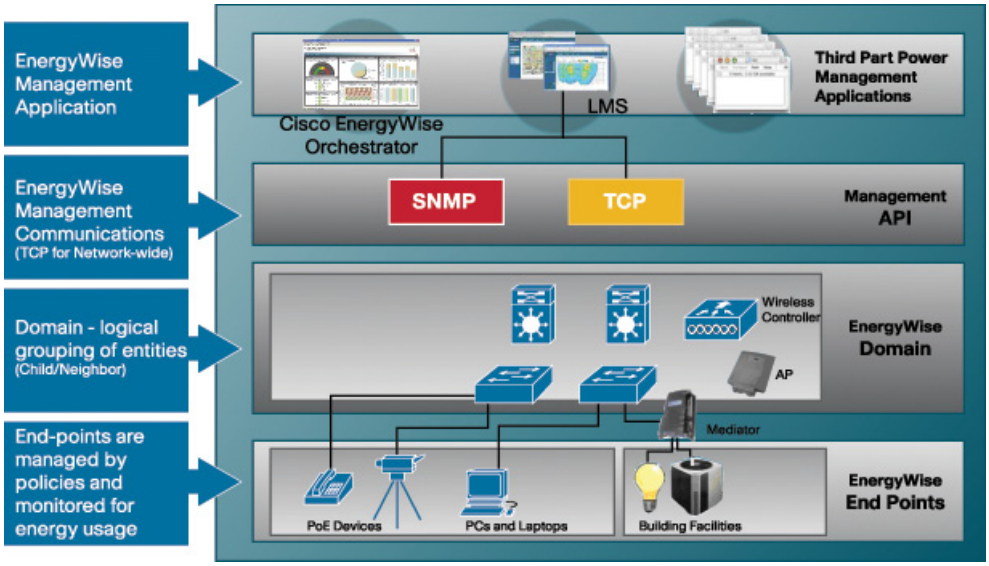
Advise

At any given time Cisco EnergyWise query mechanisms can advise customers of power consumption or changes in power consumption within a building. The query mechanisms include the ability to summarize the power for a set of devices or retrieve individual device power based on a device location. For example, Cisco EnergyWise can provide the power consumed by all lobby-located phones across a series of campus buildings. Cisco EnergyWise has the ability to let users understand what the power savings would be if the power level of certain devices were changed in the network without actually implementing the change to the network. Alarms are available if power exceeds power expectations wanted by the customer.

Regulate

The user has the ability to verify and change Cisco EnergyWise policies over time to make sure the power-saving goals for the enterprise are being achieved. Regulation is made easy within Cisco EnergyWise using the scalable framework. A network enabled by Cisco EnergyWise has the intelligence to allow a single switch in a domain to query power consumption for a group of devices in a network. This network-based query mechanism provides scalability without having a management system contact all endpoints directly. For example, a single query to one Cisco switch can change the priority or retrieve the consumption of all IP phones in a Cisco EnergyWise domain. This intelligence is produced by the network knowing which devices are connected and where they are located, allowing a query result to be sent back to the switch originating the query and up to a management station. A common message format is used by all devices enabled by Cisco EnergyWise to communicate, simplifying energy management. Cisco EnergyWise maintains network security by using authentication between management systems and the network, between clients, and between network devices (see Figure 4).

Figure 4. Cisco EnergyWise Intelligent Network Framework



Managing Cisco EnergyWise

A wide variety of management applications are available to manage a Cisco EnergyWise capable network. These include management offerings from Cisco and partners. In addition, the presence of an SNMP MIB and an API help ensure that other vendors could support power management through Cisco EnergyWise in the future. Let us look at some of the management options available for Cisco EnergyWise.

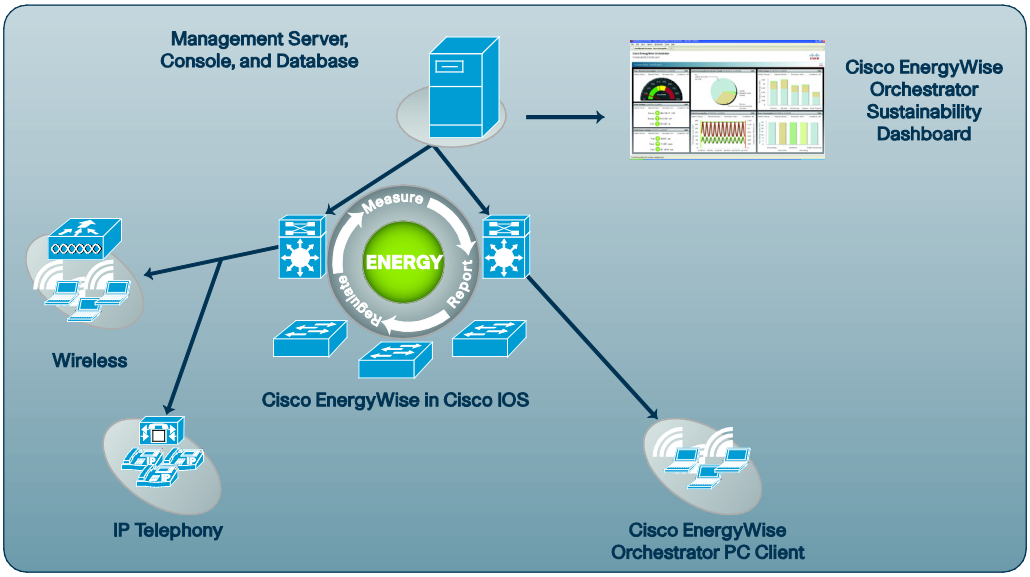
Cisco EnergyWise Orchestrator

Cisco EnergyWise Orchestrator is a dedicated turnkey power management solution for IT assets. Through its client/server architecture, Cisco EnergyWise Orchestrator provides the ability not only to administer the energy requirements of Power over Ethernet (PoE) devices, but also to extend enterprise power management to desktop and laptop PCs. This provides you with broader control over your power usage and helps reduce energy costs (see Figure 5).

Cisco EnergyWise Orchestrator, as illustrated in Figure 5, is defined by several core components.

- The Cisco EnergyWise Orchestrator server, which provides configuration, management, data aggregation, and console services for the solution
- Cisco EnergyWise technology on routers and switches, which enables coordinated power management of disparate device types and enforces policy on attached PoE devices
- The Cisco EnergyWise Orchestrator PC Client, which enables sophisticated and granular energy management for PCs and laptops
- The Cisco EnergyWise Orchestrator Sustainability Dashboard, which provides customizable management-level reports to communicate energy savings and environmental impact

Figure 5. Cisco EnergyWise Orchestrator Architecture

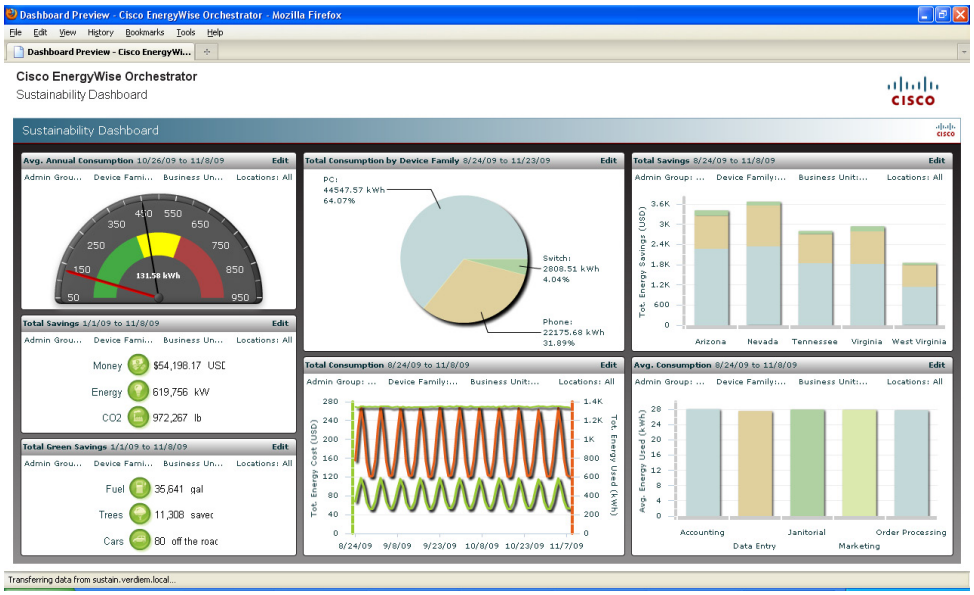


Features of Cisco EnergyWise Orchestrator

The Cisco EnergyWise Orchestrator solution enables (see Figure 6):

- A centralized interface for managing PoE network devices as well as desktop and laptop PCs
- Integration with existing Cisco EnergyWise capabilities on Cisco switches and routers
- Sophisticated policies that enhance energy savings without business impact
- Compelling reports for policy optimization, troubleshooting, and demonstration of energy savings
- Enterprise-level scalability, security, and reliability
- Minimal operating overhead with easy setup, configuration, and ongoing administration
- Graceful management of business applications before transitioning to lower power modes
- Easy desktop access for end users trying to access machines remotely
- Increased patch management reliability with dependable, on-demand wakeup over the local or wide-area network

Figure 6. Cisco EnergyWise Orchestrator Dashboard



For further details on Cisco EnergyWise Orchestrator, visit http://www.cisco.com/go/orchestrator.

CiscoWorks LAN Management Solution

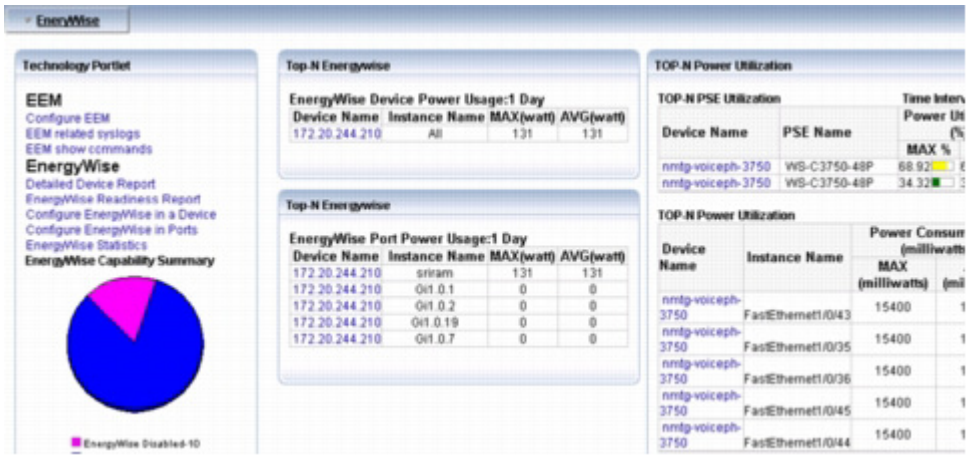
CiscoWorks LAN Management Solution (LMS) is a suite of management tools designed to simplify the management of Cisco networks. Starting with LMS 3.2, Cisco EnergyWise management is possible using LMS.

LMS 3.2 for Cisco EnergyWise provides customers with a set of management functionality that simplifies and automates the energy management lifecycle, reducing the time and effort required to transform business energy policy to real energy savings (see Figure 7).

Features of LMS 3.2

- Discover and enable Cisco EnergyWise-capable devices on the network
- Configure and implement energy management policies
- Monitor and report on power consumption
- Provide fast and easy access to Cisco EnergyWise information through a web-based portal
- Assist in troubleshooting energy-related issues

Figure 7. LMS 3.2 for Cisco EnergyWise



For more details about LMS, visit the LMS 3.2 data sheet at https://www.cisco.com/en/US/prod/collateral/switches/ps5718/ps10195/data_sheet_c67-555592.html.

SolarWinds Orion Management

The SolarWinds Orion network management system provides support for Cisco EnergyWise through its Network Configuration Management (NCM) and Network Performance Management (NPM) tools (see Figure 8).

The combination of SolarWinds Orion (NPM and NCM) with Cisco EnergyWise allows customer to:

- Reduce energy consumption
- Report on energy consumption and savings
- Compare maximum power consumption versus current power consumption
- Preview Cisco EnergyWise policies using an intuitive energy management calendar

Figure 8. SolarWinds Orion for Cisco EnergyWise

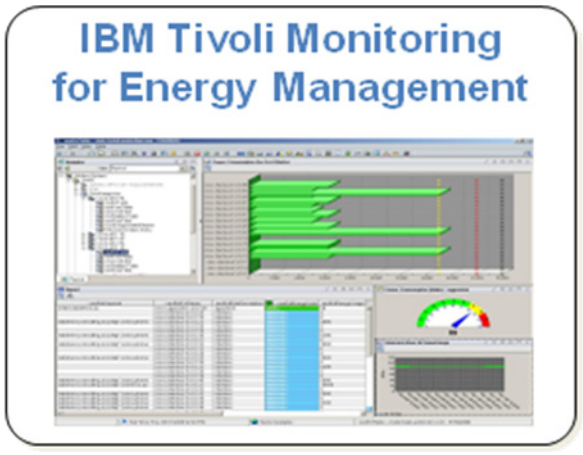
For more details on the capabilities of the Orion tool, visit http://www.solarwinds.com/cisco.

IBM Tivoli Monitoring Agent for Cisco EnergyWise

The Tivoli Monitoring Agent Version 6.2 provides support for Cisco EnergyWise power management.

The Monitoring Agent for Cisco EnergyWise is a Tivoli Agent Builder-based monitoring agent that uses the SNMP interface to pull information about the Cisco Catalyst monitored data points into the IBM Tivoli Monitoring for Energy Management system for visualization, threshold monitoring, and data collection. The power information monitored by Cisco EnergyWise agent can be stored in the ITM for Energy Management warehouse and can be consumed by other Tivoli products for complete data center and facility management (see Figure 9).

Figure 9. IBM Tivoli Monitoring Agent for Cisco EnergyWise



For further details, including the ability to order the Tivoli Monitoring Agent, visit http://www-01.ibm.com/software/brandcatalog/portal/opal/details?catalog.label=1TW10TM8B.

Can Third-Party Products Become a Part of Cisco EnergyWise?

The Cisco EnergyWise ecosystem is designed to allow multiple vendors to have their products managed using the Cisco EnergyWise framework. Customers and partners interested in developing to the Cisco EnergyWise framework need to become a part of the Cisco EnergyWise developer network. All registered members get access to an Cisco EnergyWise toolkit.

Cisco EnergyWise Toolkit

The toolkit comprises of a Cisco EnergyWise search API and a client software development kit (SDK). Using the API, partners and customers can build their own management solution to manage the Cisco EnergyWise framework. The SDK can be used to make any endpoint participate in the Cisco EnergyWise ecosystem and respond to Cisco EnergyWise queries.

For further details, including the ability to join the developer network, visit http://www.developer.cisco.com/web/cdc/home.

Which Platforms Support Cisco EnergyWise?

All Cisco Catalyst switches, including the newly announced Cisco Catalyst 2960-S, 3560-X and 3750-X Series Switches support Cisco EnergyWise. EnergyWise is available on Cisco IOS Base, LAN Base, and LAN Lite images on these switches. The Cisco Integrated Services Router Generation 2 (ISR G2) Enhanced EtherSwitch® Service modules also support Cisco EnergyWise. Newer routing platforms such as the ISR G2 also support EnergyWise. For details about a particular platform and its EnergyWise capabilities, visit the platforms portal or contact your local sales representative.

Cisco Services for Energy Management

Cisco and our partners offer professional services that help IT operations and facilities managers to plan, build, and run solutions that manage and lower energy consumption, increase overall infrastructure efficiency, and get the most from the Cisco EnergyWise architecture. Providing analysis, recommendations, and design expertise on how to improve electrical efficiency and availability of equipment, power, and cooling facilities, these services assist in building an active IP-based energy management program that helps businesses benchmark energy usage across their IT infrastructure, data center, and facilities in order to realize significant electrical savings.

Cisco Services for Energy Management help businesses:

- Establish energy efficiency benchmarks for physical infrastructure
- Improve IT infrastructure, data center, and facilities efficiency
- Fine tune electrical usage to realize significant cost savings
- Understand and optimize power through EnergyWise and building mediation

Providing specialized expertise in infrastructure and facilities energy efficiency, available professional services include:

- Cisco Infrastructure Efficiency Assessment Service: Benchmark the energy efficiency of your IT infrastructure to help lower energy consumption and plan for growth:
- Cisco Services for Business Energy Management: Plan, design, and build building mediation solutions that proactively measure, report, and optimize energy
- Cisco Data Center Efficiency Assessment Service: Benchmark the power, cooling, and facilities infrastructure of your data center to increase energy efficiency

Cisco Services are delivered by Cisco consultants and certified Cisco partners with extensive operational and energy experience. Their expertise is supported by best-in-class tools, best-practice methodologies, and superior access to Cisco product development and support resources. Working with Cisco experts and partners can help you successfully implement an IP-based active energy management program.

Cisco EnergyWise: Beyond IT

Cisco EnergyWise in conjunction with other Cisco products and partner products will ultimately extend into a common architecture that includes control and optimization of all energy-using equipment within buildings. These converged systems include heating and air conditioning, lighting, security, and others. As a first step, Cisco EnergyWise will be integrated with Cisco Building Network Mediator to provide an end-to-end power management solution from Cisco.

Cisco EnergyWise enables intelligent load management; it makes intelligent dynamic load shedding possible. With Cisco EnergyWise, customers can monitor and control power during periods of electric grid instability and peak power events. Cisco EnergyWise is the first step to instrument network equipment, making use of “smart loads.” This is valuable because buildings consume about one-third of the energy used in the United States. Electricity accounts for almost 80 percent of the energy costs in buildings.

Cisco EnergyWise is an innovative solution that helps customers actively manage and reduce power consumption by using the network intelligently, promoting companywide sustainability by reducing energy consumption across an entire corporate infrastructure. Cisco EnergyWise harnesses the power of the network to identify, manage, and reduce energy consumption and lower energy costs.

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