Branch Power Management with ISR G2

This design guide provides an overview of the power savings solutions available for ISR G2 at the branch. Power saving solutions could be implemented at the branch in several ways, via standalone control kron, via EnergyWise, and via the Cisco building mediator.

This guide provides an overview of the Branch Power Management with ISR G2 and includes the following sections:

Introduction

In terms of broad based solution, Cisco EnergyWise is probably the most scalable solution, so this design guide will primarily focus on the solution for the branch assuming EnergyWise, but it will also cover any standalone aspect of the deployment.

Cisco EnergyWise encompasses an intelligent network-based approach to communicate messages that measure and control energy between network devices and endpoints. The network discovers Cisco EnergyWise manageable devices, monitors their power consumption, and takes action based on business rules to reduce power consumption. EnergyWise uses a unique domain-naming system to query and summarize the information from large stes of devices, making it simpler than the trasitional network management capabilities. Cisco EnergyWise's management interfaces allow deivces and network management applicatoins to communicate with endpoints, third party devices with EnergyWise SDK

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applications and each other using the network as unifying fabric. The management interface uses standard Simple Network Management Protocol (SNMP) or Secure Sockets Layer (SSL) to integrate Cisco and third-party management systems.

Products That Support EnergyWise, and Software Version in which It Was Made Available

Besides ISR G2 and it EtheSwitch modules, several other Cisco Products and third pary products support EergyWise.

Table 1 shows Cisco switches that support EnergyWise.

Table 1 Switches

Product	Release supported
Catalyst 2960	12.2(50)SE
Catalyst 3760	12.2(50)SE
Catalyst 3560-E	12.2(50)SE
Catalyst 3760-E	12.2(50)SE
Catalyst 3560	12.2(50)SE
Catalyst 4500	12.2(52)G
Catalyst 4500-E	12.2(52)G
Catalyst 6500	12.2(33)SXJ
Catalyst 6503	12.2(33)SXJ
Catalyst 6503-E	12.2(33)SXJ
Catalyst 6506 and 6506-E	12.2(33)SXJ
Catalyst 6509 and 6509-E and 6509-V-E	12.2(33)SXJ
Catalyst 6509-NEB and 6509-NEB-A	12.2(33)SXJ
Catalyst 6513	12.2(33)SXJ

Table 2 shows Cisco routers that support EnergyWise.

Table 2 Routers

Product	Release supported
Cisco 39XX Series Routers	15.0.(1) M2 and 15.1 (1) T1
Cisco 29XX Series Routers	15.0.(1) M2 and 15.1 (1) T1
Cisco 19XX Series Routers	15.0.(1) M2 and 15.1 (1) T1
Cisco 89X Series Routers	15.0.(1) M2 and 15.1 (1) T1

Product	Release supported
Cisco 88X Series Routers	15.0.(1) M2 and 15.1 (1) T1
Cisco 86X Series Routers	15.0.(1) M2 and 15.1 (1) T1

Modules for Routers

ISR G2 Hardware design is unique and allows EnergyWise to extend some of its capabilities and concenpts to the routers. This made the ISR G2 a power manager device for the branch. For instance, all the Service Modules, Internal Service Modules, and Packet Voice Digital Signal Processor Modules (PVDM3) are children of the router and could have its power controlled by EnergyWise.

Table 3 shows the ISR G2 modules that have functionality integrated with EnergyWise.

Table 3 ISR G2 modules with functionality integrated EnergyWise

Product	Functionality	Minimum Releases supported	
		ISR G2s	Module
SM-ES2-16-P	Child and Neighbor	12.2(55)SE or 12.2(52)EX	Single-wide Layer 2 enhanced EtherSwitch service
SM-ES3-16-P	Child and Neighbor	12.2(55)SE or 12.2(52)EX	Single-wide Layer 2 and Layer 3 enhanced EtherSwitch service
SM-ES3G-16-P	Child and Neighbor	12.2(55)SE or 12.2(52)EX	Single-wide Layer 2 and Layer 3 enhanced EtherSwitch service
SM-ES2-24-P	Child and Neighbor	12.2(55)SE or 12.2(52)EX	Single-wide Layer 2 enhanced EtherSwitch service
SM-ES3-24-P	Child and Neighbor	12.2(55)SE or 12.2(52)EX	Single-wide Layer 2 and Layer 3 enhanced EtherSwitch service
SM-ES3G-24-P	Child and Neighbor	12.2(55)SE or 12.2(52)EX	Single-wide Layer 2 and Layer 3 enhanced EtherSwitch service
SM-D-ES2-48-P	Child and Neighbor	12.2(55)SE or 12.2(52)EX	Double-wide Layer 2 enhanced EtherSwitch service
SM-D-ES3-48-P	Child and Neighbor	12.2(55)SE or 12.2(52)EX	Double-wide Layer 2 and Layer 3 enhanced EtherSwitch service

SM-D-ES3G-48-P	Child and Neighbor	12.2(55)SE or 12.2(52)EX	Double-wide Layer 2 and Layer 3 enhanced EtherSwitch service
SM-SRE-700-K9	Child	15.0.(1) M2 or 15.1(1)T	Service Ready Engine
SM-SRE-900-K9	Child	15.0.(1) M2 or 15.1(1)T	SRE
ISM-SRE-300-K9	Child	15.0.(1) M2 or 15.1(1)T	SRE
PVDM3-16	Child	15.0.(1) M2 or 15.1(1)T	High-Density Packet Voice Video Digital Signal Processor
PVDM3-32	Child	15.0.(1) M2 or 15.1(1)T	High-Density Packet Voice Video Digital Signal Processor
PVDM3-64	Child	15.0.(1) M2 or 15.1(1)T	High-Density Packet Voice Video Digital Signal Processor
PVDM3-128	Child	15.0.(1) M2 or 15.1(1)T	High-Density Packet Voice Video Digital Signal Processor
PVDM3-192	Child	15.0.(1) M2 or 15.1(1)T	High-Density Packet Voice Video Digital Signal Processor
PVDM3-256	Child	15.0.(1) M2 or 15.1(1)T	High-Density Packet Voice Video Digital Signal Processor
HWIC-4ESW-P	Child	15.0.(1) M2 or 15.1(1)T	EtherSwitch 4- and 9-Port High-speed WIC
HWIC-D-9ESW-P	Child	15.0.(1) M2 or 15.1(1)T	EtherSwitch 4- and 9-Port High-speed WIC
NME-16ES-1G	Neighbor	12.2(50)SE	EtherSwitch Service
NME-16ES-1G-P	Neighbor	12.2(50)SE	EtherSwitch Service
NM-16ESW-1GIG	Neighbor	12.2(50)SE	EtherSwitch Service
NM-16ESW	Neighbor	12.2(50)SE	EtherSwitch Service
HWIC-1GE-SFP	Nanny	15.0.(1) M2 or 15.1(1)T	1- and 2-Port Fast Ethernet High-Speed WIC

HWIC-1FE	Nanny	15.0.(1) M2 or 15.1(1)T	1- and 2-Port Fast Ethernet High-Speed WIC
HWIC-2FE	Nanny	15.0.(1) M2 or 15.1(1)T	1- and 2-Port Fast Ethernet High-Speed WIC
Front panel FE/GE interfaces	Nanny	15.0.(1) M2 or 15.1(1)T	

Table 4 shows Cisco Tools that support EnergyWise.

Table 4 Tool

Product	Release supported
Network Management	Cisco LMS 3.2

Table 5 shows third party products that support EnergyWise.

Table 5 Third party products

Product Category	Product	Release recommended
Network Management Tool	SolarWinds	Net flow: Version 3 IPSLA: Version 3 NCM: Version 6 NPM: Version 10

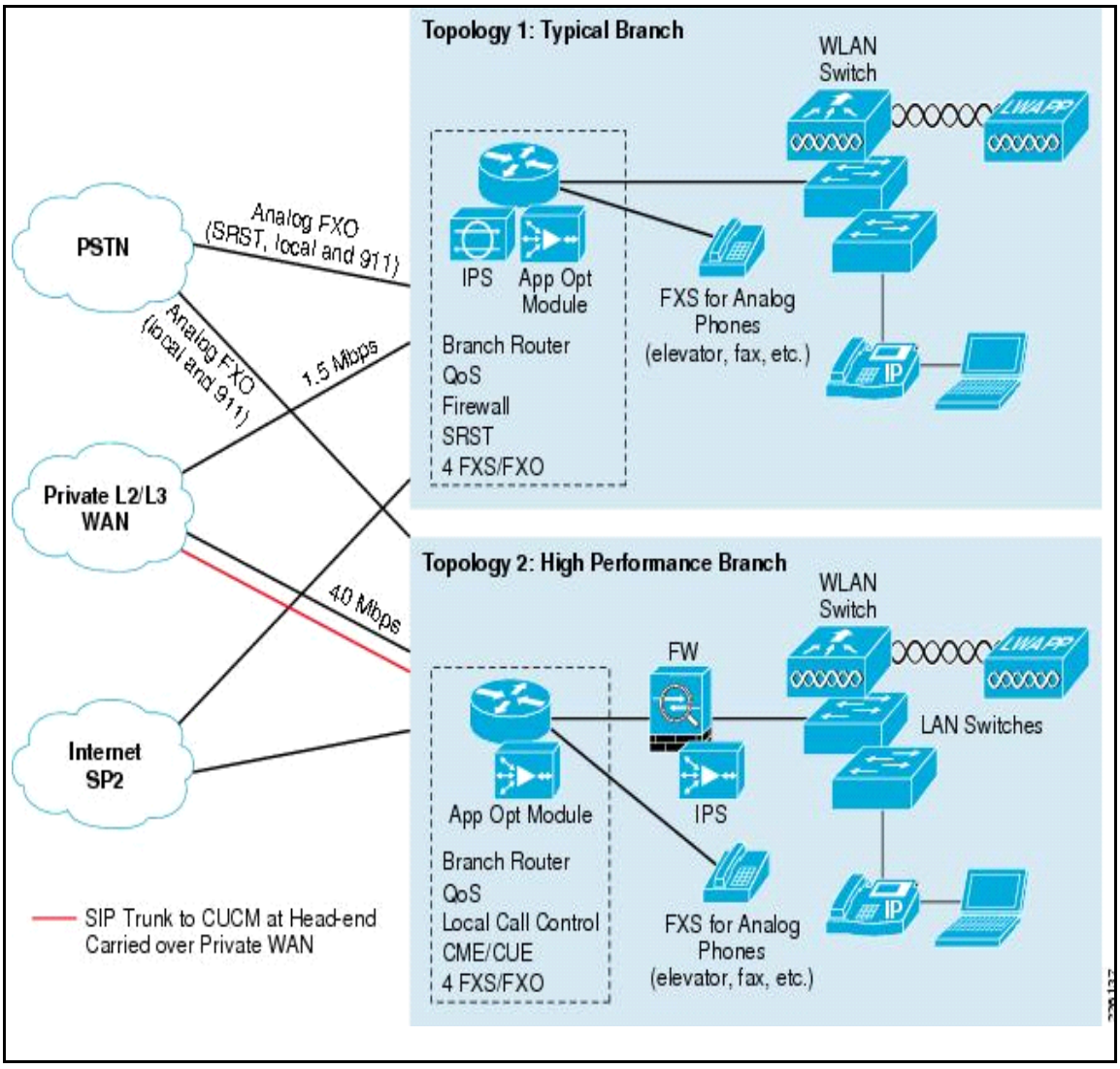
Sample of Configurations

Because this configuration guide is focused towards. EnergyWise deployment on the branch, the samples assume that the routers are already configured accordingly to the design guide for the branches.

Figure 1 shows the configuration guide sample for EnergyWise deployment on the branch.

Figure 1 EnergyWise branch deployment configuration sample

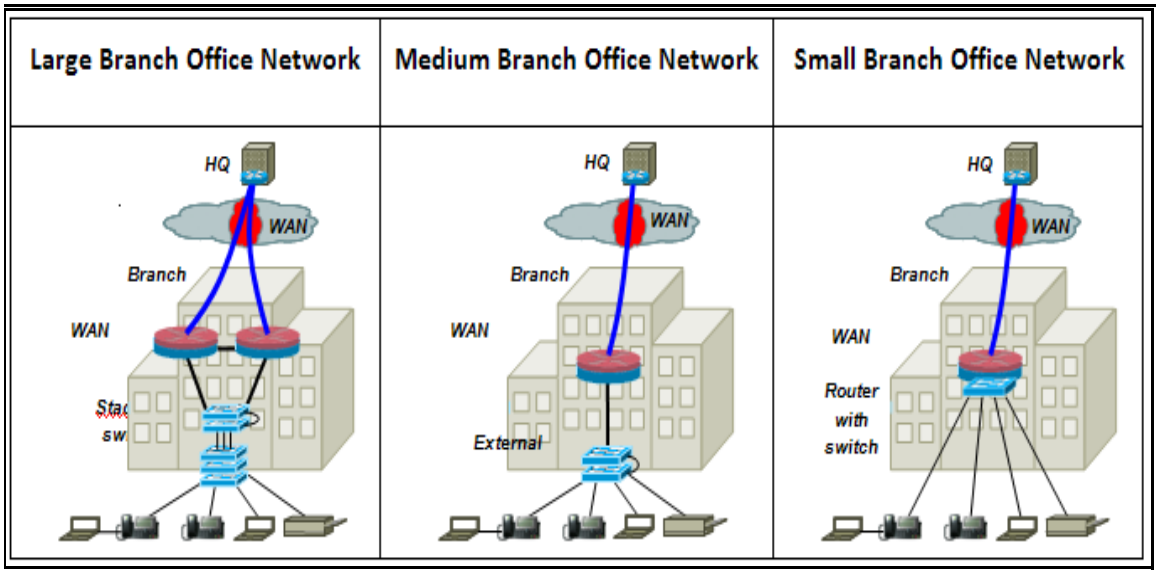
It is important to notice that WLAN switches above could be and External Switches or the Enhanced



EtherSwitch Modules in a form of Service Module for the routers.

Figure 2 shows the guide provided for scalability for EnergyWise at the branch.

Figure 2 Scalability for EnergyWise at the branch



The configuration for the Large Branch Office has a stack of switches, routers, and common endpoints (VoIP phones, Computers, Access Points, and so forth). In this environment, the endpoints are connected to the switch, so the branch configuration for the endpoints is exactly the same configuration provided by the documents related to EnergyWise up to this point. The new factor is the introduction of the router that is recommended if possible due to EnergyWise scalability limitations of 5000 endpoints per domain to be configured in the same domain of the switches, making the routers and switches seem as neighbors.

In this type of configuration, the ISR G2 may have a Service Ready Engine (SRE) in a SM or ISM form factor and PVDM3s, depending on the needs of the customer. The ISR G2 configuration for these modules could follow the control schedule configured for the branch.

The Medium Branch is not very different, in terms of configuration, from the Large Branch. It also has the switch external to the router and most of the documents related to EnergyWise configuration up to this point provide the guidelines for that configuration. The same recommendation related to the ISR G2 deployment with SREs and PVDM3s still apply to this case.

The Small Branch is the configuration with less documentation available, making it the focus of attention. This environment has the switch as a module of router using the EtherSwitch Modules, see http://cisco.com/en/US/prod/collateral/routers/ps10538/aag_c07_563807.pdf. The EtherSwitch modules run their own IOS, which is different from the IOS that is running on the ISR G2. Cisco made further improvements in the communications of the Enhanced EtherSwitch Modules (SM form factor of the EtherSwitch Modules mentioned above) and created new parameters within EnergyWise to correctly convey the message that those modules are neighbors and child of the ISR G2. The EtherSwitch modules can be configured in a different EnergyWise domain than the EnergyWise domain in ISR G2. However, we recommend using the same configuration because the modules are using the same source of power.

Several modules of the ISR G2 are able to be configured for EnergyWise following the concepts defined by EnergyWise and it is able to control power to SM, ISM, and PVDM3 ports. It can also control power to the ports of the HWICS: HWIC-4ESW-P, HWIC-D-9ESW-P modules. This is especially attractive to the 19XX platforms. Although EnergyWise can control the ISM slots, for the 1941-W, EnergyWise does not have the capability to power off the radio in 15.0(1)M2 or 15.1(1)T.

Operations

The unique hardware design of the ISR G2 gives it the power control to all modules, including SM, ISM, EHWICs, and PVDM3. EnergyWise makes use of the hardware capabilities and implemented power control to SM, ISM, and PVDM3s. The ports on EHWICs can also be controlled by EnergyWise. EnergyWise operations for ISR G2 platforms follow the same CLI commands defined for EnergyWise.

Table 6 shows how the SM, ISM, and PVDM3s have their Energy Levels mapped

Table 6 SM, ISM and PVDM3s Energy Levels

SM and ISM		PVDM3s	
Category	**Level**	**Category**	**Level**
Operational	1-10	**Operational**	2-10
Non-operational	0	**Standby**	0-1

The ports on the HWICs follow the same energy levels mapped for the SM and ISM.

Figure 3 shows the configuration of EnergyWise level.

Figure 3 IOS CLI

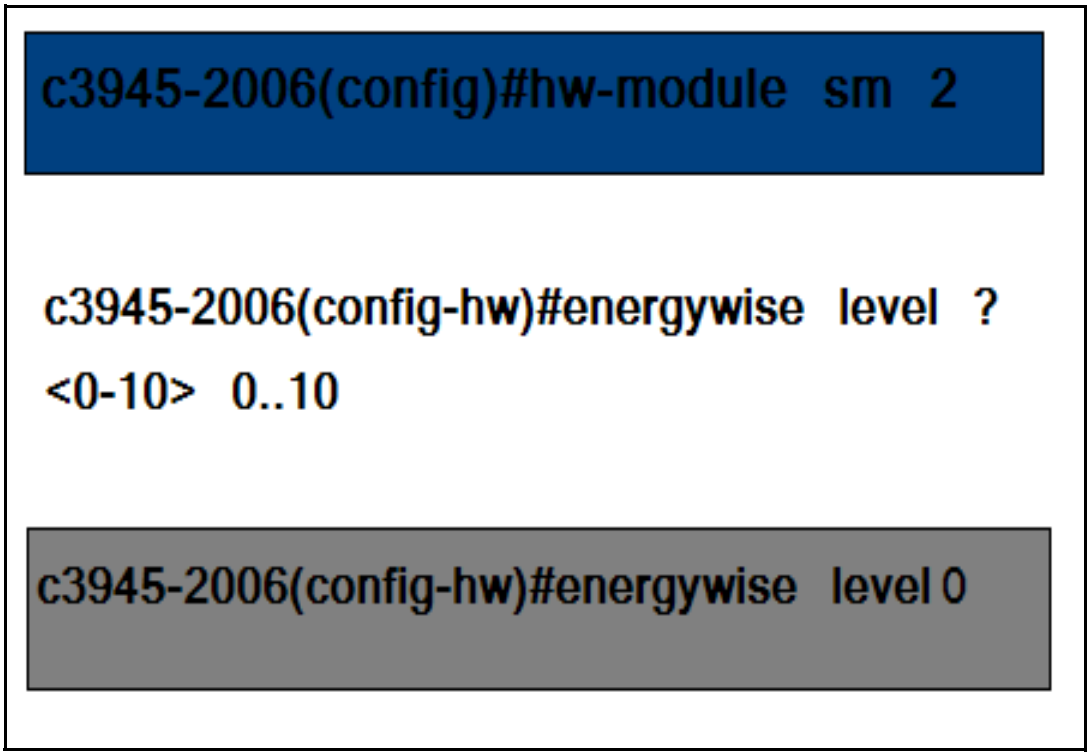


Figure 4, Figure 5, and Figure 6 show that even on standalone fashion, ISR G2 provides flexibility and allows the process to be automated using Kron.

Figure 4 Standalone fashion

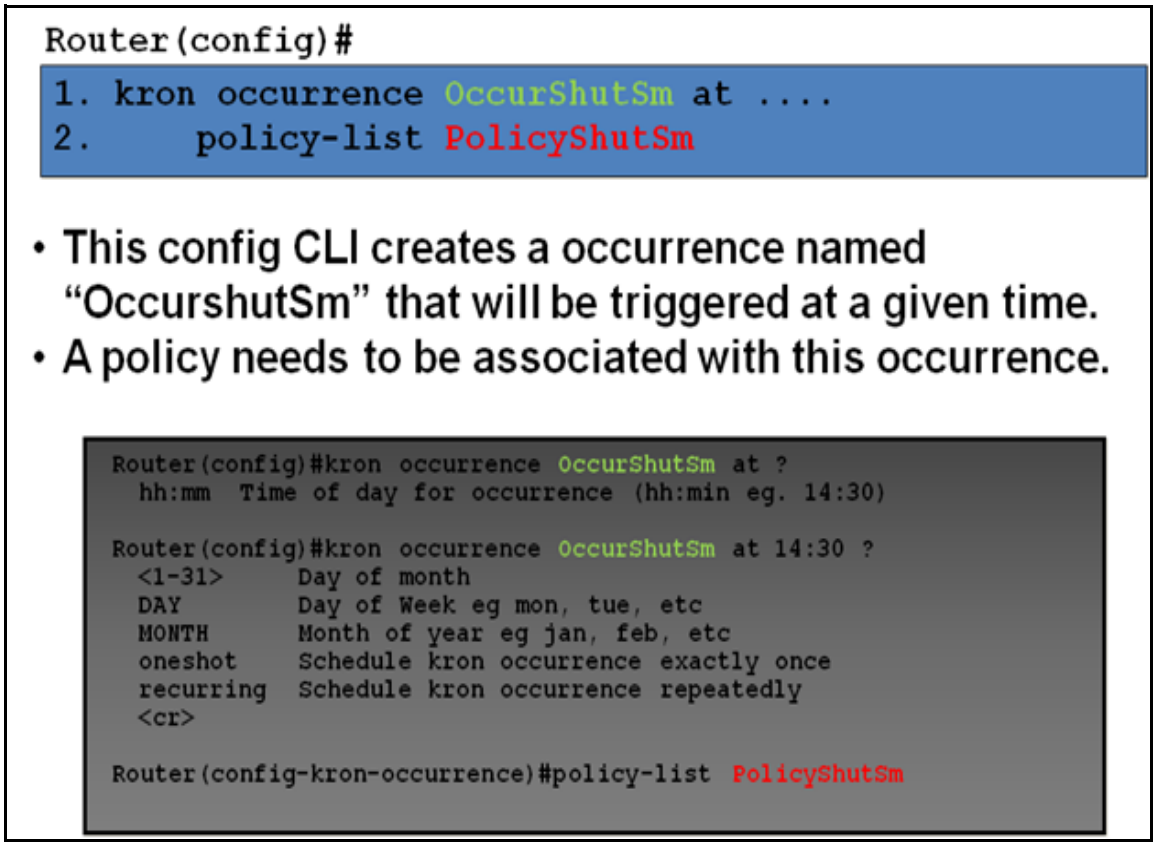


Figure 5

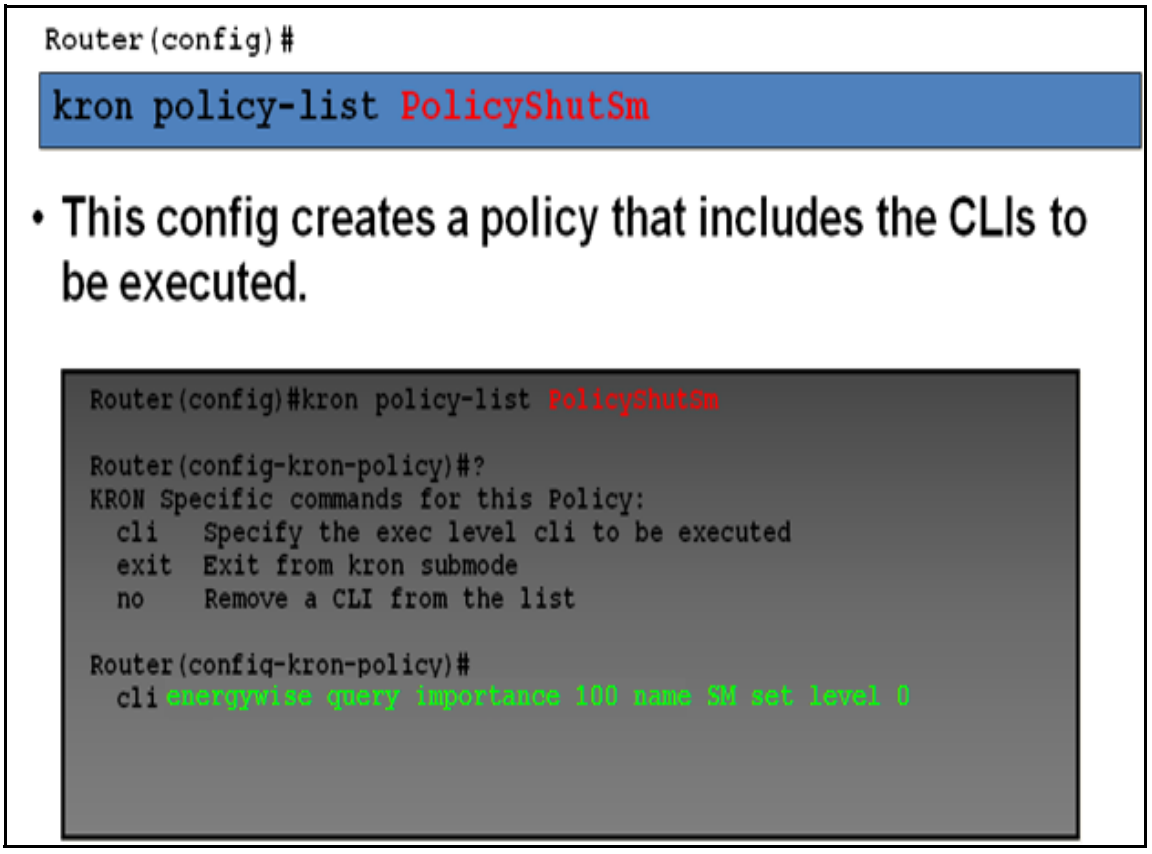
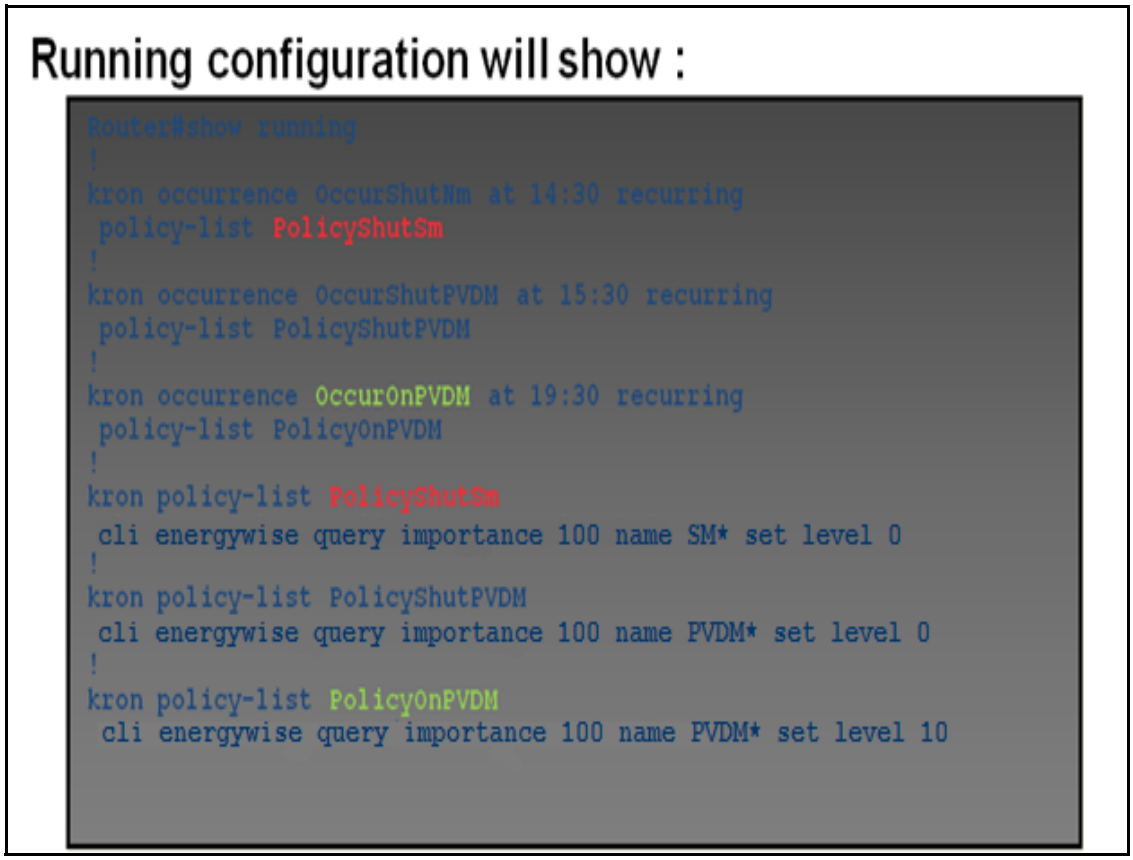

Router(config)#
kron policy-list PolicyShutSm
• This config creates a policy that includes the CLIs to be executed.
Router(config)#kron policy-list PolicyShutSm
Router(config-kron-policy)#?
KRON Specific commands for this Policy:
cli Specify the exec level cli to be executed
exit Exit from kron submode
no Remove a CLI from the list
Router(config-kron-policy)#
cli energywise query importance 100 name SM set level 0

Figure 6



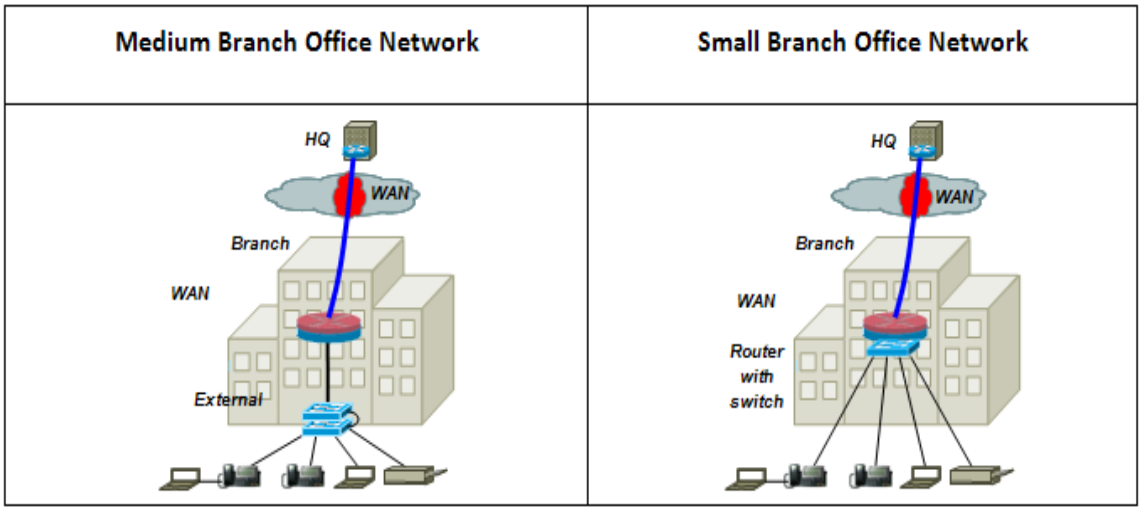
Deployment Scenarios

As described earlier, the Small Branch office network has the most options for EnergyWise configuration at the branch for ISR G2. This section discusses how to get a Small Branch office with ISR G2 and an enhanced EtherSwitch module configured.

Considering that it will be important to have all the power information for the branch available at the branch and at headquarters, it will be important to show the commands that will make them available at both places.

Figure 7 shows the Medium and Small Branch Office Network.

Figure 7 Medium and Small Branch Office Network



Adding EnergyWise to the ISR G2 router configuration

1. Under the global configuration, enable energywise through “energywise domain” CLI:

```
Router (config)# energywise ?
Router (config)# allow     Energywise allow query set command
                -> allows the query set commands to be passed to the parent entity.
Router (config)# domain    Set the EneryWise domain this entity should join
                -> sets the global domain of which this router will be part of.
Router (config)# endpoint  Set the EnergyWise endpoint access options
                -> sets the shared secret key for the endpoint (for Nanny)
Router (config)# importanceA rating of the importance this EnergyWise parent entity has in
the network
Router (config)# keywords  EnergyWise keywords associated with this parent entity.
Router (config)# level     Set the EnergyWise level of this parent entity
Router (config)# managementenergywise management access options
                -> sets the shared secret key for management
Router (config)# name      EnergyWise name for this parent entity
Router (config)# neighbor  Specify a static neighbor
Router (config)# role      The role of this EnergyWise entity has in the network
```

Enable the global configuration for EnergyWise:

```
SIT-SJ1-C3945-CME3(config)#energywise domain lab security shared-secret 0 cisco protocol
udp port 60000
```

2. Configure the module as children entities, the Energywise Level will be 10, Importance will be 1 by default. User can change them under “hw-module”:

```
Router# conf t
Router(config)# hw-module sm 1
Router(config-hw)# energywise ?
allow          Energywise allow query set command
importance     A rating of the importance this EnergyWise entity has in the network
```

```
keywords    EnergyWise keywords associated with this entity
level       Set the EnergyWise level of this interface or attached entity
name        EnergyWise name for this entity
role        The role this EnergyWise entity has in the network
<cr>
```

Enable EnergyWise under hw-module for each module.

```
hw-module pvdm 0/0
    energywise importance 100
    energywise keywords xformer_mod

hw-module ism 0
energywise level 8
energywise importance 100
energywise keywords xformer_mod
```

On switch, can configure the following under the interface that IP phone connected.

```
EE-switch# conf t
EE-switch (config) #interface FastEthernet0/3 (then configure the following after it
gets into the interface)
EE-switch (config-if) # switchport access vlan 172
EE-switch (config-if) # energywise importance 100
EE-switch (config-if) # energywise keywords phone_1st_floor
```

3. Verify the configuration issuing CLI command: **show energywise children** on router. It will display the platform specific information for parent (router) and children entities (connected modules, switches). In the following example, PVDM3, SM (EtherSwitch) module, and ISM (CUE) modules are connected.

```
Router#show energywise children
Module/Interface   Role       Name            Usage      Lvl    Imp         Type
---------   ----          ----               ----       ---         ---    ---
       CISCO3945-MIDPLN   SIT-SJ1-C3945-CME3 138.0 (W)  10     100         parent
PDVDM 0/0   *                 PVDM 0/0       6.0   (W)  10     100         module
SM 1        *                 SM 1           26.0  (W)  10     100         attached
ISM 0       *                 ISM 0          12.0  (W)  10     1           module

Total Displayed: 4        Usage: 182.0
```

On the router, you can also run the following CLIs to collect more usage information:

show energywise level, show energywise level children— Displays wattages for various levels

show energywise usage, show energywise usage children— Displays the current usage and the calibration type.

show evergywise level current, show energywise level current children: Displays the current usage for the platform and children.

4. You can also go into the individual module, to collect an usage. In this example, the SM (Enhanced EtherSwitch) module is used.

```
Router#service-module gigabitEthernet 1/0 session
Trying 40.40.76.1, 2067 ... open
```

On switch, can configure the following under the interface that IP phone connected:

```
EE-swtich# conf t
EE-switch (config)# interface FastEthernet0/3 (then donfigure the following after it get
into the interface)
EE-switch (config-if)# switchport access vlan 172
EE-switch (config-if)# energywise importance 100
```

```
EE-switch (config-if)# energywise keywords phone_3rd_floor
EE-switch#show energywise children
Module/Interface   Role       Name           Usage      Lvl    Imp        Type
----------------   ----       ----           -----      ----   ---        ----
           SM-ES3-24-P    EE-switch          26.0 (W)   10     100        parent
Fa0/2      IP Phone 7941  SEP0019552CB723*   5.931(W)   10     100        PoE
Fa0/3      IP Phone 7962  SEP001E4A92580B*   4.266(W)   10     100        PoE
Fa0/4      IP Phone 7962  SEP002155554A4B*   4.318(W)   10     100        PoE
Fa0/5      IP Phone 7961  SEP001759E9691A*   4.266(W)   10     100        PoE

Total Displayed:   5      Usage:  44.8
```

However, EnergyWise also supports the EtherSwitch modules (NM). These modules have less interaction with the EnergyWise running on ISR G2 (there is no sharing of informaiton between the module and ISR G2. ISR G2 does not see those modules as a child and ISR G2 won't be able to power off the module). You can still configure EnergyWise on these modules and make them part of the domain.

```
Router#service-module gigabitthernet 2/0 session
Trying 13.13.13.13, 2131 ... Open
mirage_switch#

mirage_switch1# conf t
mirage_switch1# interface FastEthernet1/0/1
mirage_switch(config-if)#description connected to sccp-2202
EE-switch(config-if)# switchport access vlan 172
EE-switch(config-if)# energywise importance 100
EE-switch(config-if)# evergywise keywords phone_3rd_floor

mirage_switch1#show energywise
Module/Interface   Role       Name           Usage      Lvl    Imp        Type
----------------   ----       ----           -----      ----   ---        ----
           NM-16ES-1G-P   Ether_switch1      11.0 (W)   10     1          parent
Fa1/0/1    IP Phone 7962  SEP001E4A92580B*   4.266(W)   10     100        PoE
```

5. Considering the larger branch, if the network has EnergyWise-supported external switches, ports on internal switches, and modules; when neighbor relationship is set up through CDP or UDP for all connected devices, user is able to control the power of connected neighbor devices using Energywise query CLI.

Enable EnerygWise on ISRG2 platform, hw-modules, and corresponding Internal switches through CLI.

Set up the neighbor either through CDP or UDP for all connected devices.

You can control the power of the connected devices through a query on ISRG2.

The following is a sample configuration:

Enable global configuration for energywise.

```
Router(config)# energywise domain lab security shared-secret 0 cisco protocol udp port
60000
```

Checking neighbors.

```
Router#sh energywise neighbors
Capability Codes:  R- Router, T- Trans Bridge, B- Source Route Bridge
                   S- Switch, H- Host,I- IGMP, r- Repeater   P- Phone  U- Unkonwn
Id      Neighbor Name          Ip: Port           Prot    Capability
--      -------------          --------           ----    ----------
4       3750-siphonix-switch4  15.2.42.5:60000    cdp     U
5       EE-switch              15.2.42.3:60000    udp     S I
```

```
6       mirage_switch1         15.2.42.4:43440    cdp     S
7       SIT-SJ1-C2911-CME2     10.10.11.179:60000 udp     R

Router# show energywise
Interface  Role           Name                   Usage      Lvl     Imp     Type
---------  ----           ----           -----      ---     ---     ----    ----
           WS-C3750G      3750-siphonix-switch4  284.0 (W)  10      100     parent
```

Control the power level with the query command.

```
SIT-SJ1-C3945-CME3#energywise query importance 100 name EE-switch set level 8
EnergyWise query timeout is 3 seconds:
Success rate is (0/0) setting entities
Queried: 0             Responded: 0                Time: 0.999 seconds
```

Control the power level with the hw-module (can only set the level either as 10 or 0).

```
SIT-SJ1-C3945-CME3(config)#hw-module sm 1
SIT-SJ1-C3945-CME3(config-hw)#energywise level 0
```

Control the power level through hw-module (can only set the level either as 10 or 0).

```
SIT-SJ1-C3945-CME3(config)#hw-module sm 1
```

6. You can configure energywise recurrences on specific interfaces. This example sets a power level on a specific port to turn on at 8:00 a.m. (0800) and turn off at 8:00 p.m. (2000), and to do this each day of the week (recurring continuously):

```
3750-switch(config)#int g1/0/1
3750-switch(config-if)# energywise level 10 recurrence importance 100 at 00 08 * * *
3750-switch(config-if)# energywise level 0 recurrence importance 100 at 00 20 * * *
```

Power control occurs within the configured minute. For example, if power is scheduled to be turned on at 8:30 a.m. (0830), it will be turned on between 8:30 a.m. (0830) and 8:31 a.m. (0831).

A range of ports can also be specified to simplify configuration. This configures ports 1, 2, 3, and 4 at the same time with the same options, turns PoE on at 8:00 a.m. (0800), off at 5:30 p.m. (1730):

```
EE-switch(config)# interface range fa0/1 - 4
    energywise level 10 recurrence importance 100 at 00 08 * * *
    energywise level 0 recurrence importance 100 at 30 17 * * *
    energywise keywords xformer_test
    energywise name shipping.2
    energywise importance 100
    !
```

Specific days can also be configured. This example turns PoE on at 7:00 a.m. (0700) and, off at 6:00 p.m. (1800), and does this on Monday through Friday. When PoE is turned off on Friday, it remains off until the following Monday morning.

```
Mirage-switch(config)# interf
EE-switch(config)# interface range fa0/2 - 10
EE-switch(config-if)# energywise level 10 recurrence importance 100 at 00 07 * * 1-5
EE-switch(config-if)# energywise level 0 recurrence importance 100 at 00 18 * * 1-5
```

You can view the setting by running CLI **show energywise recurrence**

```
mirage_switch1#sh energywise recurrences
Id  Addr       Class Action Lvl Cron/Time-range
--  ---        ------------------------------
1   Fa1/0/1    QUERY SET   10 minutes: 00 hour: 07 day:*month:*weekday:1-5
```

```
2   Fa1/0/2     QUERY SET   10 minutes:00 hour:07 day:*month*weekday 1-5
3   Fa1/0/3     QUERY SET   10 minutes:00 hour:07 day:*month*weekday 1-5
4   Fa1/0/4     QUERY SET   10 minutes:00 hour:07 day:*month*weekday 1-5
5   Fa1/0/5     QUERY SET   10 minutes:00 hour:07 day:*month*weekday 1-5
6   Fa1/0/1     QUERY SET    0 minutes:00 hour:18 day:*month*weekday 1-5
7   Fa1/0/2     QUERY SET    0 minutes:00 hour:18 day:*month*weekday 1-5
8   Fa1/0/3     QUERY SET    0 minutes:00 hour:18 day:*month*weekday 1-5
9   Fa1/0/4     QUERY SET    0 minutes:00 hour:18 day:*month*weekday 1-5
10  Fa1/0/5     QUERY SET    0 minutes:00 hour:18 day:*month*weekday 1-5
```

Note The external and internal switches also provide the ability to check current active calls before shutting the power off using recurrence policy under the interfaces:

```
interface GigabitEthernet1/0/43
    srr-queue bandwidth share 10 10 60 20
    srr-queue bandwidth shape 10 00  0
    queuu-set 2
    priority-queue out
    mls qos trust device cisco-phone
    mls qos trust cos
    energywise level 10 recurrence importance 100 at 00 07 * * 1-5
    energywise level 0 recurrence importance 100 at 00 18 * * 1-5
    energywise activitycheck
    energywise importance 100
    energywise keywords xfromer_mod
    auto qos voip cisco-phone
    service-policy input AutoQoS-Police-CiscoPhone
```

You should note the following when using activitycheck:

- Make sure that the **sh mls qos maps cos-output-q** command has the following output:

```
Cos-outputq-threshold map:
            cos: 0  1   2   3   4   5   6   7
            ----------------------------------
queue-threshold: 4-3 4-2 3-3 2-3 3-3 1-3 2-3 2-3
```

  All the traffic marked cos 5 (which is what Cisco IP Phone at the source would mark it as) is directed to queue 1 at threshold 3.

- Assuming that the phone is connected to g1/0/43, configure auto qos on that interface, and also configure the activitycheck on that interface.
- Make sure that the source phone also has auto qos on it. This would ensure that the cos is not marked down at the entry point.
- If you have multiple devices between your phones, make sure that you enable cos trust on them so that cos value is preserved by the time it reaches the destination phone.
- After this is done, make the phone call and try to set the level to 0 through a query. It will do activity check and will not turn off the destination phone. One manual check that you can do is to look at the qos statistics on the interface. When the call is in progress, you can see a steady increase in the packets on queue 1:

```
3750-siphonix-switch4# sh mls qos interface gigabitEthernet 1/0/43 statistics | beg cos
       cos: incoming
       -----------------------
       0-4:    23279   0       0       0       0
       5-7:    0       0       0
       cos: outgoing
       -----------------------
       0-4:    17003   0       0       552     0
       5-7:    0       0       0
       :
```

```
        :
3750-siphonix-switch4# sh mls qos interface gigabitEthernet 1/0/43 statistics | beg cos
        cos: incoming:
        -----------------
        0-4:    40652   0       0       0       0
        5-7:    0       0       0
        cos: outgoing:
        -----------------
        0-4:    17003   0       0       552     0
        5-7:    0       0       0
        :
        :
3750-siphonix-switch4# sh mls qos interface gigabitEthernet 1/0/43 statistics | beg cos
        0-4:    40652   0       0       0       0
        5-7:    0       0       0
        cos: outgoing:
        -----------------
        0-4:    31486   0       0       654     0
        5-7:    0       0       0
```

7. Consider the tools and configuration needed to monitor the network remotely via Solarwinds:
   - Under ISR G2 Global configuration, enable EnergyWise and setup the role, importance and keywords, and so forth.

     ```
     energywise domain lab security shared-secret 0 cisco protocol udp port 60000
     energywise importance 100
     energywise role CISCO3945-MIDPLN
     energywise keywords xformer_mod
     ```

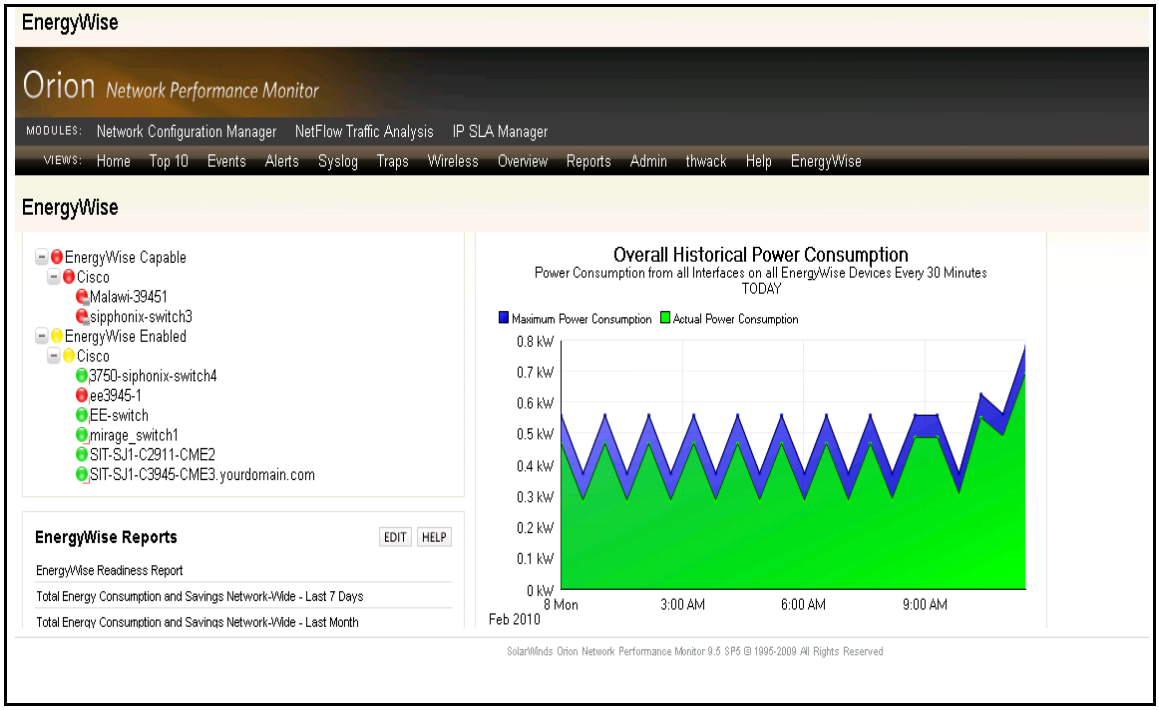
   - Configured the SNMP community string:

     ```
     snmp-server community ciscorw RW
     snmp-server community ciscoro RO
     ```

   - After configuring all the nodes on Solarwinds, you can view the overall EnergyWise report.

Figure 8 shows the EnergyWise report.

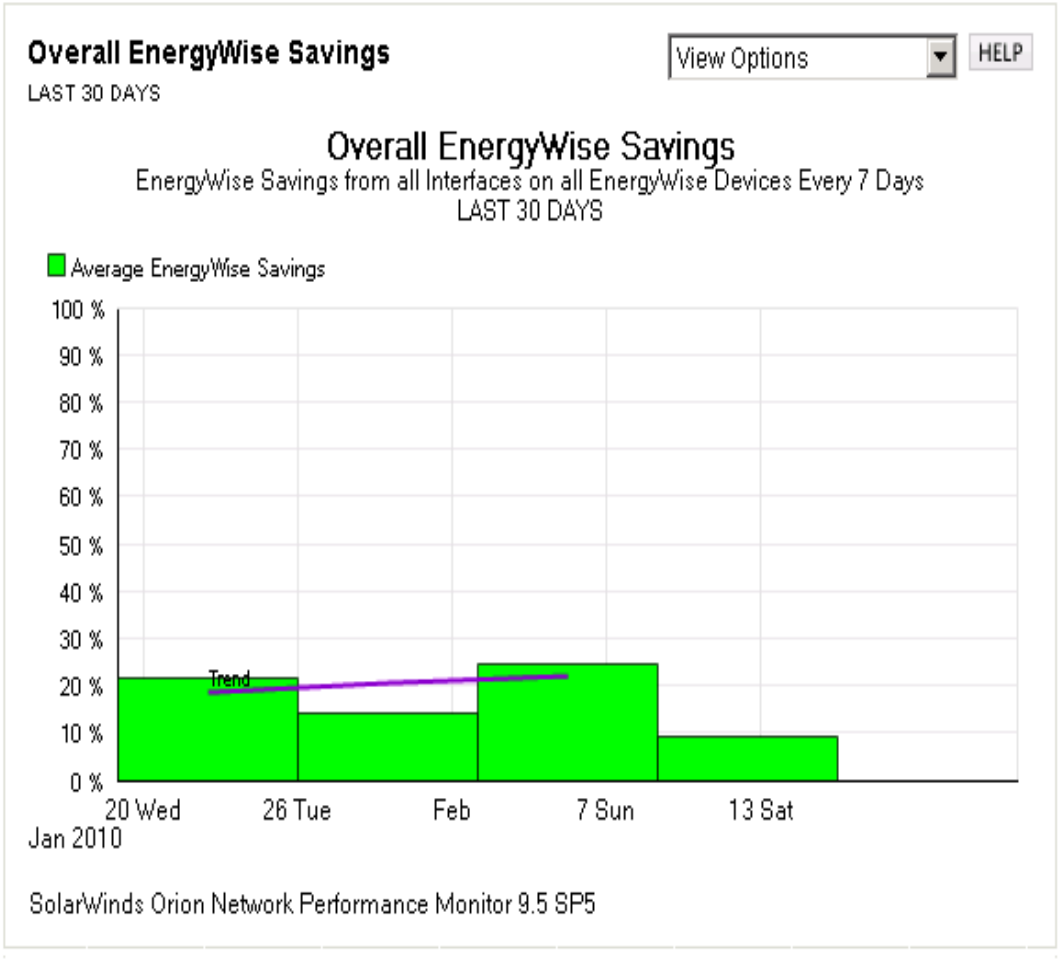
Figure 8 EnergyWise report



– Check how energy is saved weekly, daily, or monthly.

Figure 9 shows how energy is saved weekly, daily, or mothly.

Figure 9 Overall EnergyWise Savings



– You can also check the individual ISR G2 platform.

Figure 10, Figure 11, and Figure 12 show the individual ISR G2 platforms that you can check.

Figure 10 ISR G2 platform

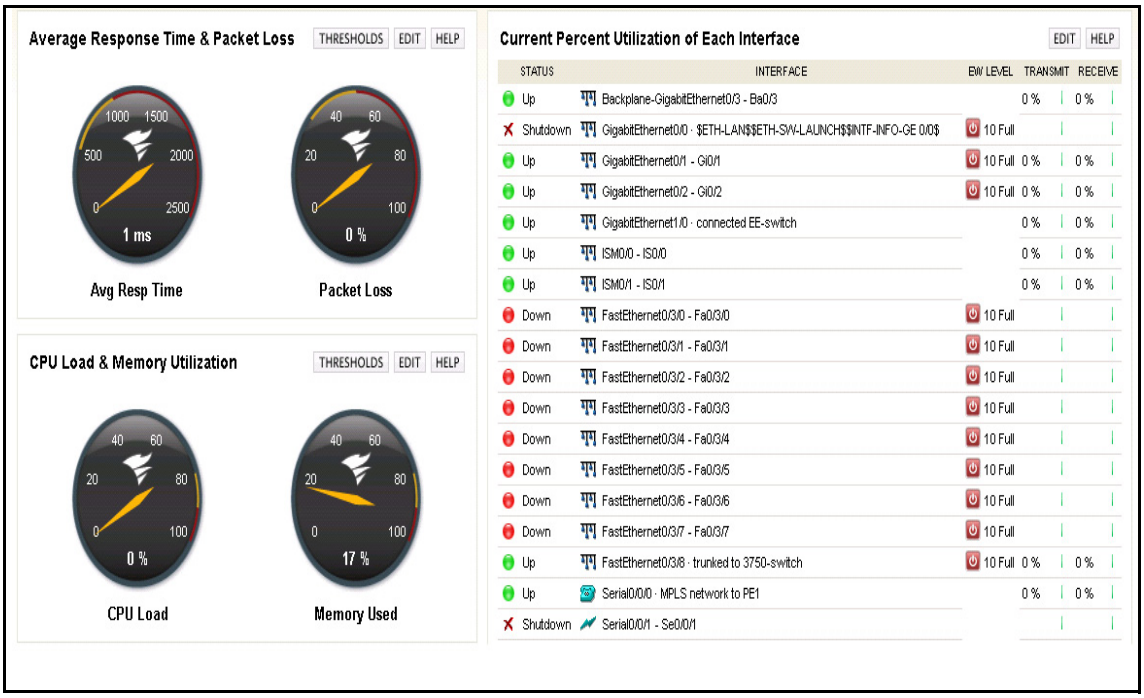


Figure 11 ISR G2 platform

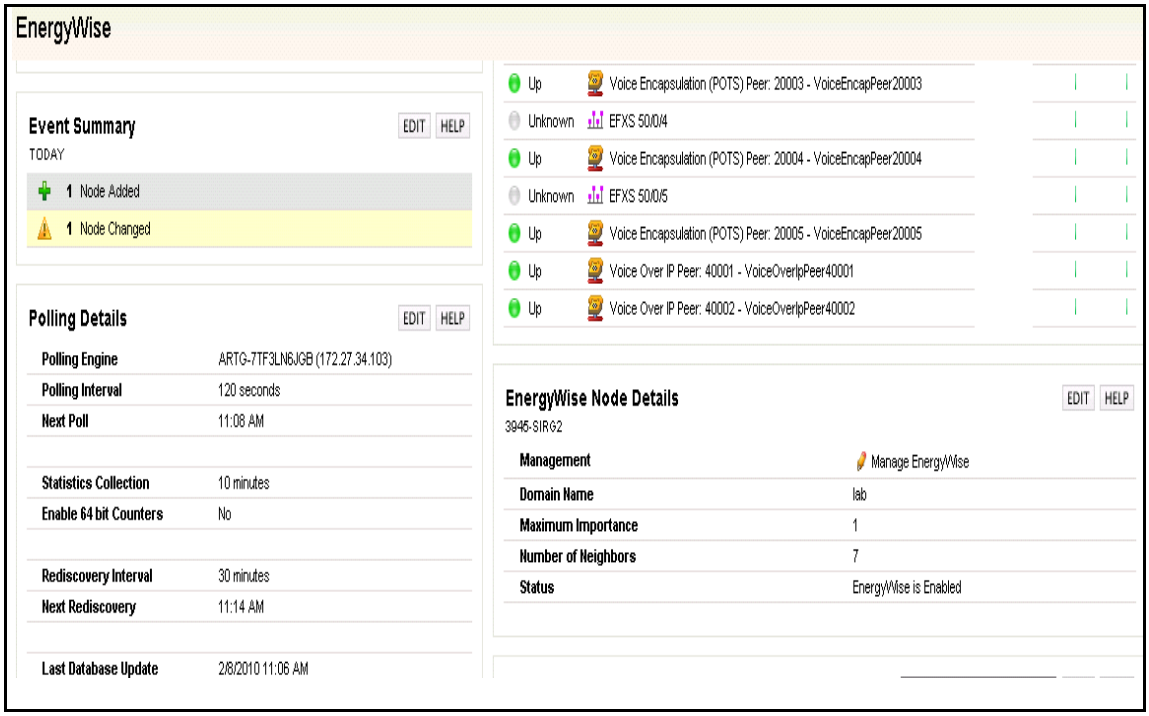
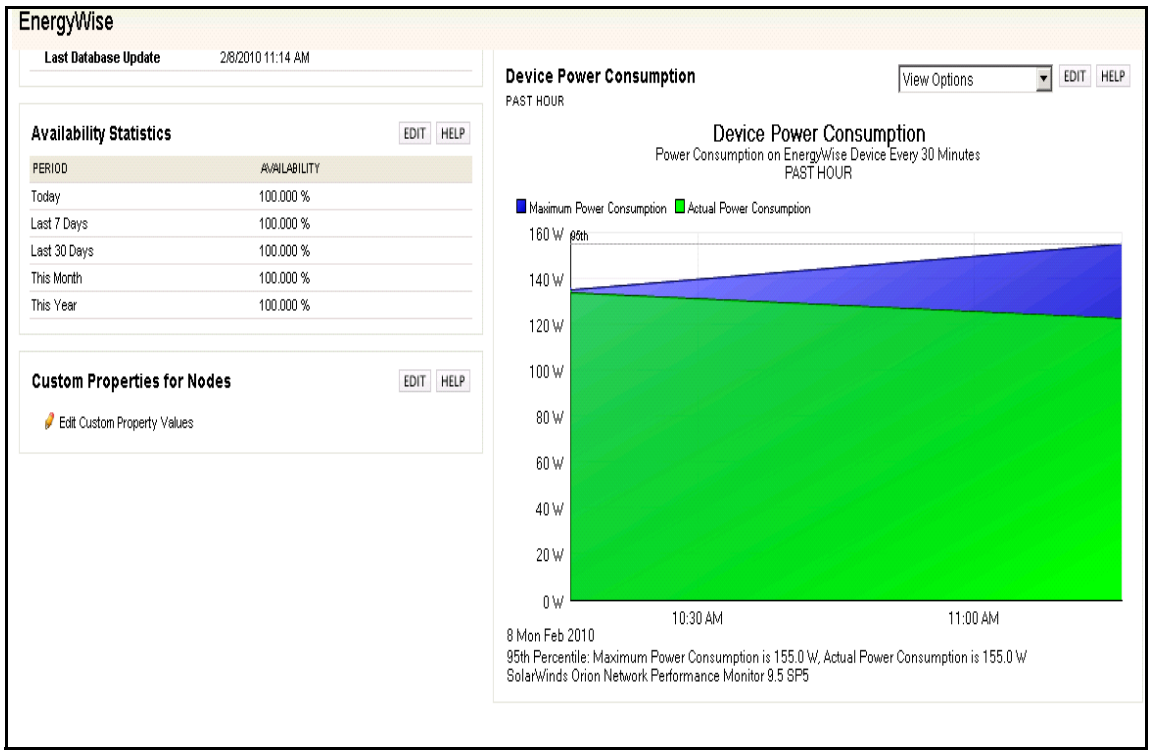


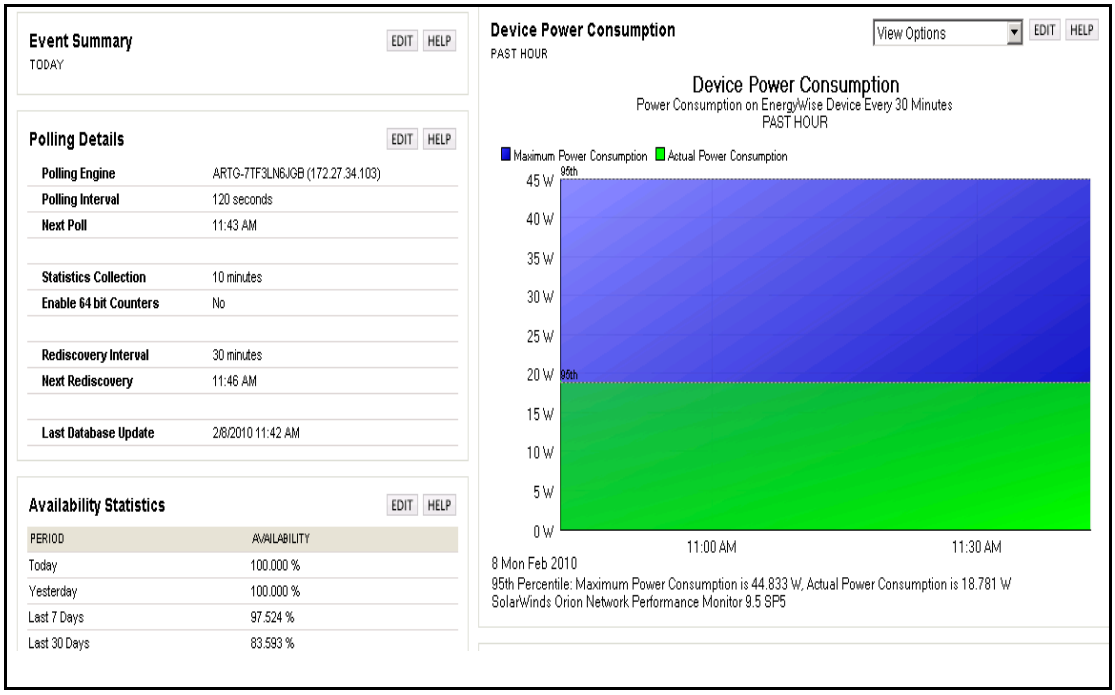
Figure 12 ISR G2 platform



– To view Internal Switches, click the individual EtherSwitches.

Figure 13 shows the individual EtherSwitches that you click to view internal switches.

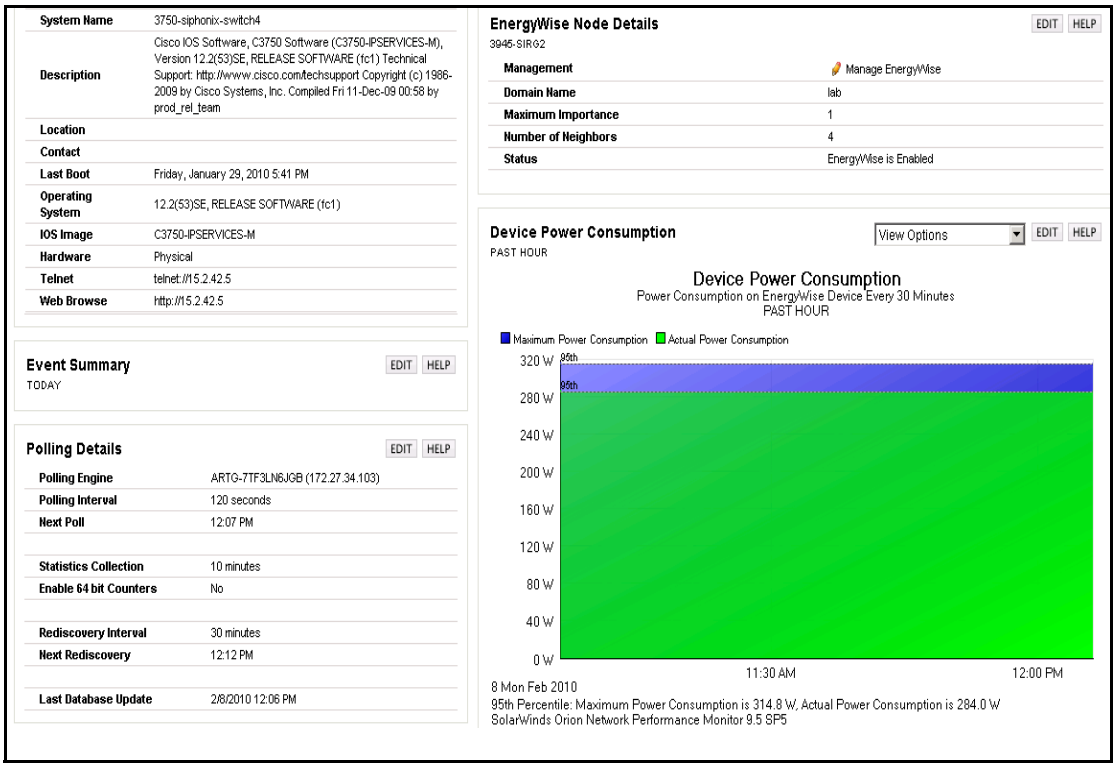
Figure 13 Individual EtherSwitches



– To view external 3750 or 3560 switches, clickthe corresponding switches.

Figure 14 shows the switches to click to view the external 3750 or 3560 switches.

Figure 14 Switches



– Run the EnergyWise reports on ISRG2, the total outputs and individual EtherSwitch, 3750 or 3560 switches are matched with the report from NM tools:

```
SIT-SJ1-C3945-CME3#sh energywise children
Module/Interface   Role       Name           Usage      Lvl     Imp        Type
----------------   ----       ----           -----      ----    ---        ----
           CISCO3945-MIDPLNSIT-SJ1-C3945-CME3110.0(W)    10      100        parent
PVDM 0/0       *              PVDM 0/0         6.0(W)    10      1          module
SM 1           *              SM 1            26.0(W)     8      1          attached
ISM 0          *              ISM 0           13.0(W)    10      1          module
F
Total Displayed:   4      Usage:  155.0

EE-switch#sh energywise children
Module/Interface   Role       Name           Usage      Lvl     Imp        Type
----------------   ----       ----           -----      ----    ---        ----
           SM-ES3-24-P    EE-switch          0.0  (W)    10      100        parent
Fa0/2      IP Phone 7941  SEP0019552CB723*   5.932(W)    10      100        PoE
Fa0/3      IP Phone 7962  SEP001E4A92580B*   4.266(W)    10      100        PoE
Fa0/4      IP Phone 7962  SEP002155554A4B*   4.318(W)    10      100        PoE
Fa0/5      IP Phone 7961  SEP001759E9691A*   4.266(W)    10      100        PoE

Total Displayed:   5      Usage:  18.8

3750-siphonix-switch4#sh energywise
Interface  Role           Name                   Usage       Lvl     Imp        Type
---------  ----           ----                   ----        ---     ---        ----
           WS-C3750G-48PS 3750-siphonix-switch4  284.0 (W)   10      100        parent
```

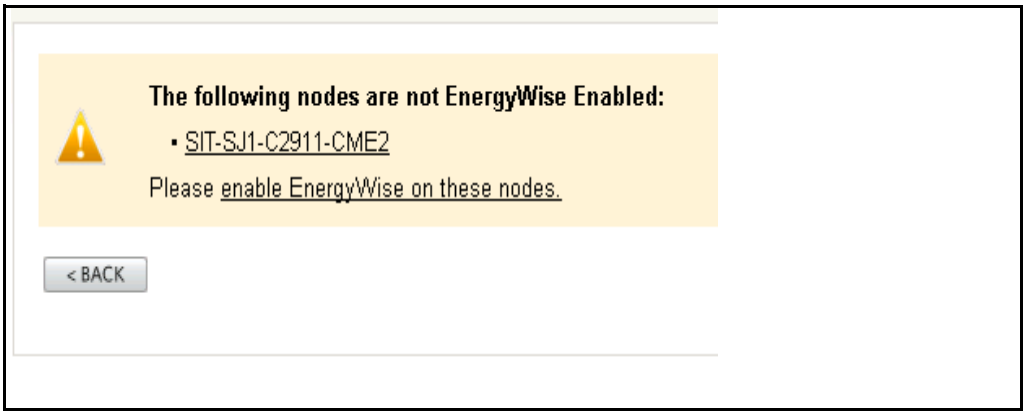
```
3750-siphonix-switch4#
```

7. Consider the tools and configuration needed to control the network remotely via Solarwinds:

On Solarwinds NPM page,
Admin -> Manage Nodes -> Click **more actions** to choose **manage energywise**.

Figure 15 shows the Managing Nodes Screen.

Figure 15 Managing nodes screen



Click the link **Enable EneryWise on these nodes**. You are prompted to enable EnergyWise features, and then configure: Energywise Name, keywords, default power level, importance, role, domain, secret, and so forth.

– After finishing all the configurations, choose **Execute Actions** -> ok -> Complete.

Figure 16 and Figure 17 show the outputs before EnergyWise was configured.

Figure 16 Output before configuring EnergyWise

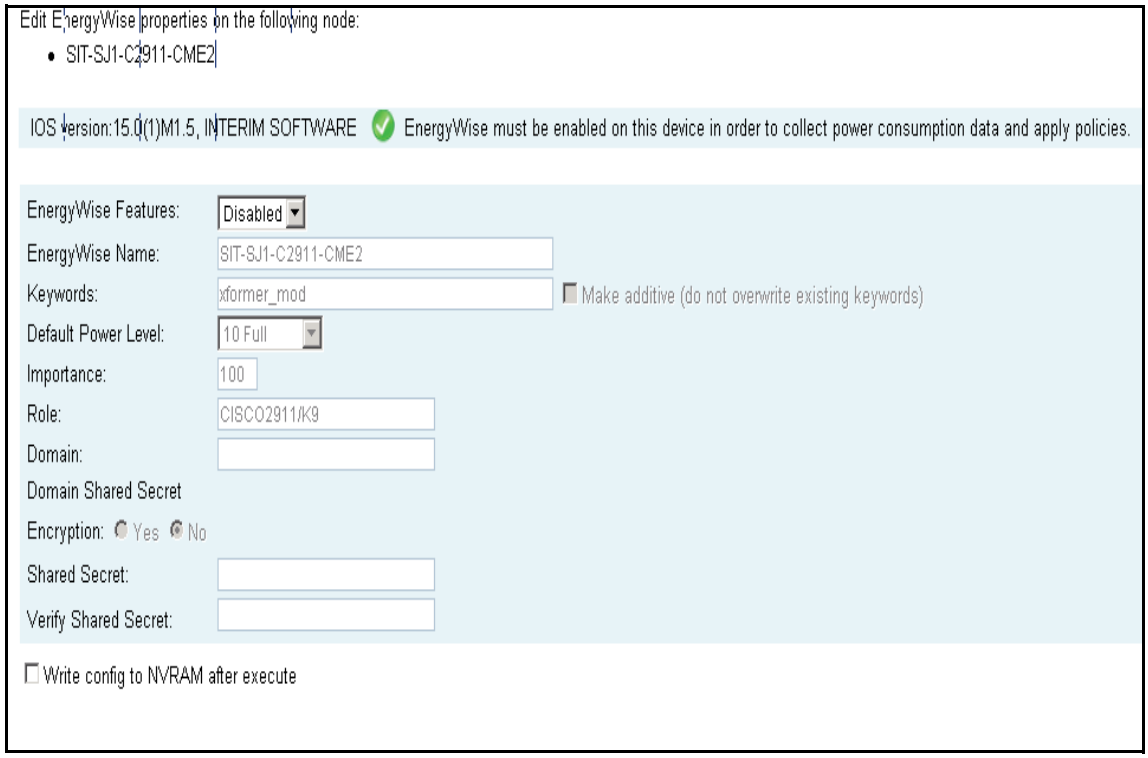


Figure 17 Output before configuring EnergyWise

Figure 18 and Figure 19 show the outputs after the configuration for EnergyWise is done.

Figure 18 Output after configuring EnergyWise

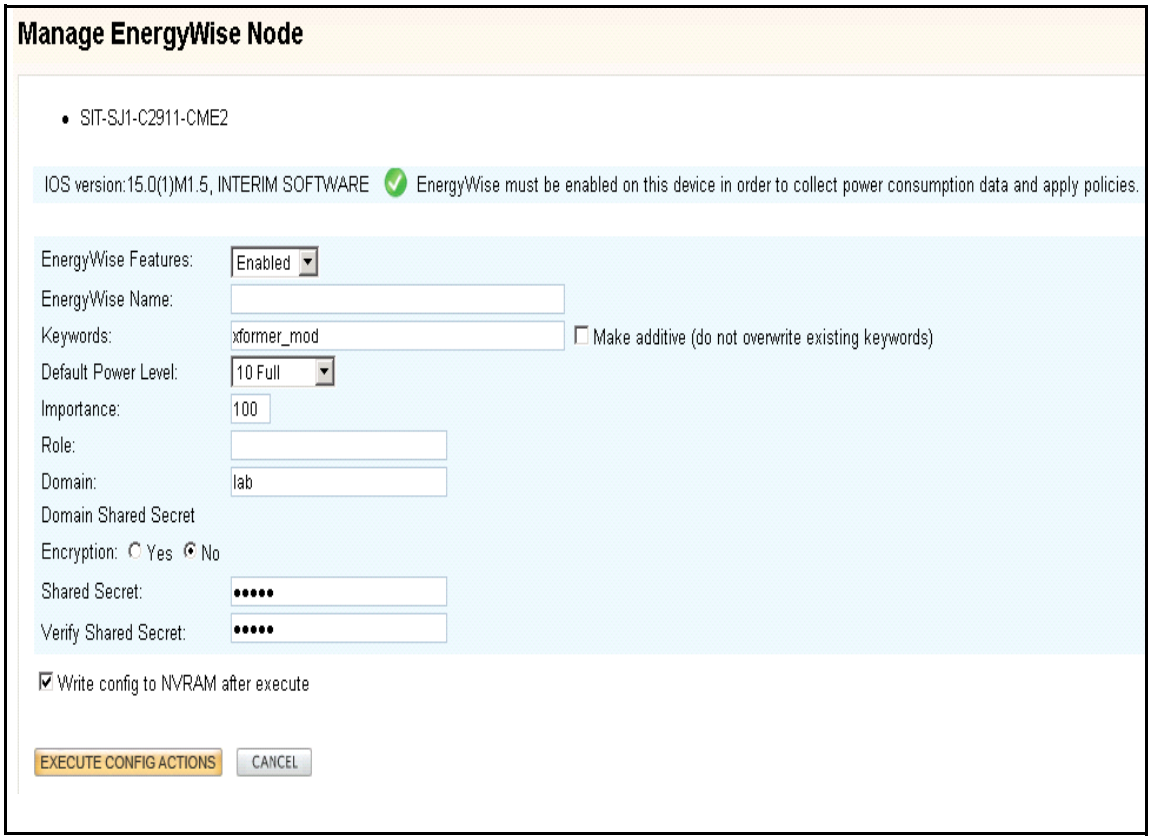
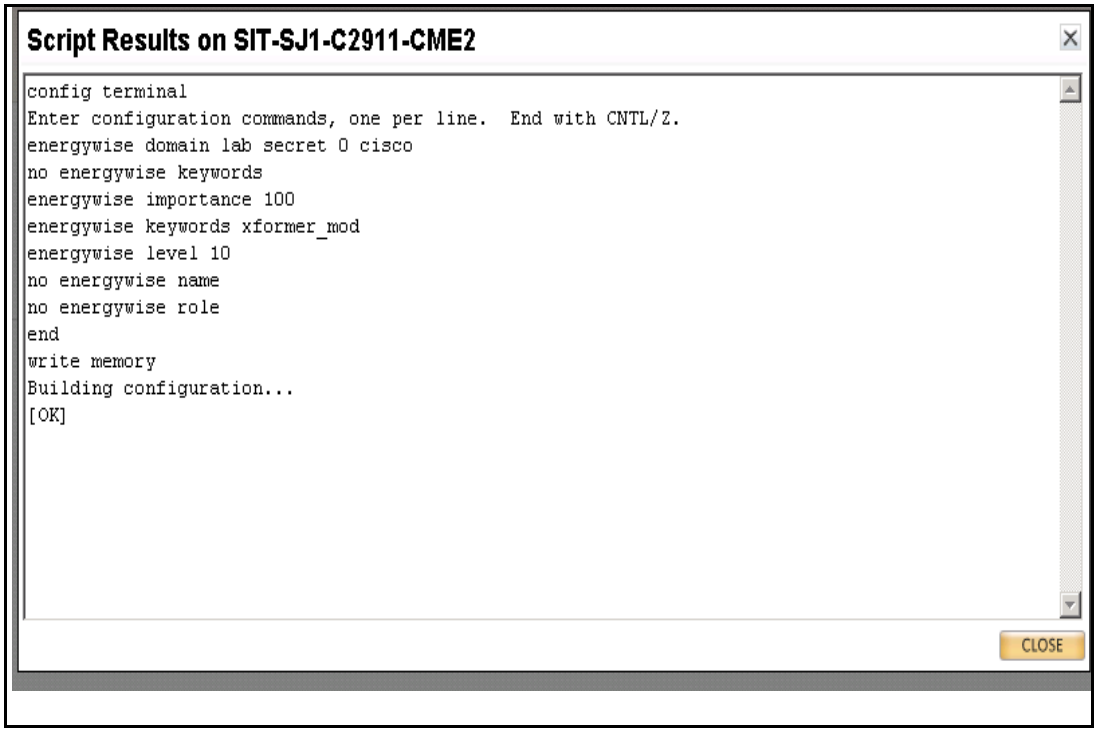


Figure 19 Output after configuring EnergyWise



– Verification from ISR G2 has the same results as configured on SolarWinds:

```
SIT-SJ1-C29!!-CME2#sh run | i energ
energywise domain lab security shared-secret 0 cisco
energywise importance 100
energywise keywords xformer_mod

SIT-SJ1-C2911-CME2#sh energywise
Module/Interface   Role       Name                  Usage      Lvl     Imp        Type
----------------   ----       ----                  ---        ---     ----       ----
           CISCO2911/K9   SIT-SJ1-C2911-CME2        65.0 (W)   10      100        parent
SIT-SJ1-C2911-CME2#
```