EnergyWise for Advanced ePDUs

EnergyWise Quick Start

11/15/2011

Document Revision: 0.2

Table of Contents

1 Introduction

1.1 Purpose

The aim of this document is to provide the required information to use EnergyWise on the ePDU.
It contains:

- a brief description of EnergyWise (to obtain more information: see REF_1 & REF_2)
- the configuration parameters used from HyperTerminal
- the EnergyWise agent ePDU states
- the EnergyWise parameters managed by the ePDU

1.2 References

[REF_1]: EnergyWise Introduction White.pdf	Cisco document
[REF_2] : ew_v2.pdf	Cisco document
[REF_3] : Eaton advanced Epdu User guide	Eaton Document

2   General description of Cisco EnergyWise

The Cisco EnergyWise network provides power usage management for the EnergyWise compatible power devices connected to the network.

This one defines three different kinds of devices (REF 1):
- Management Station: to control and manage the power usage of Endpoints connected to the domain members.
- Domain member (switch, router, …) : to forward messages between Managements stations and Endpoints.
- Endpoints: the devices that use or control power like the ePDU.

The ePDU is an Endpoint in the EnergyWise network terminology.
It has several attributes (name, role, level ….see REF 2), and the Management Station can run queries to:
- Read this attribute (Collect queries).
- Summarize and aggregate attributes has consumptions of several Endpoints (aggregate queries).
- Write these attributes (Set queries).

These attributes allow for example to switch on or off the ePDU outlets (level attribute), to measure consumption of the outlets …

The domain members forwards queries from Management stations to Endpoint devices.
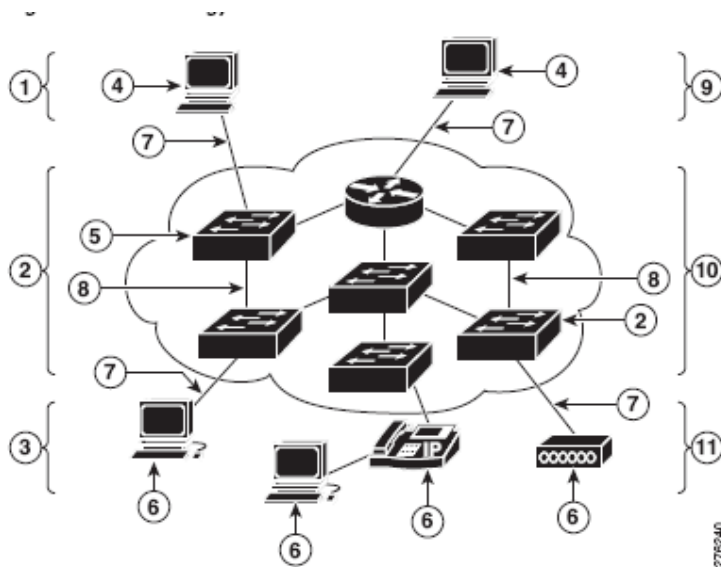
1	Network management stations	7	TCP
2	Domain members	8	UDP
3	End points	9	Runs queries and sets EnergyWise attributes
4	Management station	10	Runs, forwards, and responds to queries
5	Domain member	11	Responds to queries
6	End point		

Figure 1 : Cisco EnergyWise Domain

To obtain more information, refer to your Cisco documentation.

2.1 Endpoint Description

2.1.1 Entity description
An Endpoint can be composed of one or several entities. Each entity can be monitored individually.

In case of the ePDU, the Endpoint is composed of:
- One entity for the ePDU: master
- One entity for each outlet
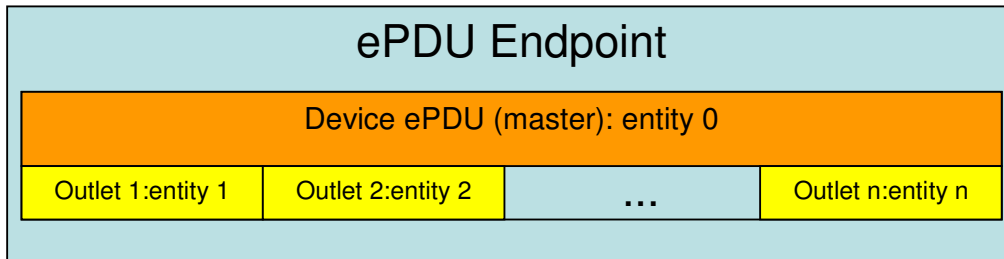
2.1.2 Power level description
EnergyWise defines 11 levels to manage the power usage of the device. For each level, a functional behavior is associated:

Category	Level	Label
	10	Full
	9	High
Operational (1)	8	Reduced
	7	Medium
	6	Frugal
	5	Low
	4	Ready
Standby (0)	3	Standby
	2	Sleep
	1	Hibernate
Nonoperational (-1)	0	Shut

The master (entity 0), when powered will be always set to 10 and his level cannot be remotely set.
The outlets will have two levels remotely settable:
- 0 : turn off
- 10: turn on

A threshold level is defined to share the On/Off switch operation: during a set operation, the outlet is switched off if the level set is below this threshold, else the outlet is switched On. But, whatever the level, during a Get level operation, 10 will be always returned if the outlet is On, and 0 if the Outlet is Off:

Set Level query:
- If the new level is equal or superior to the threshold level: the outlet is switched On.
- If the level is below the threshold level: the outlet is switched Off.

Get Level query:
- If the outlet is powered (On), the returned level is 10.
- If the outlet is NOT powered (Off), the returned level is 0.

2.1.3 ePDU Type

Depending on the ePDU model: SW (Switched), AM (Advanced Monitored) and MA (Managed), the usage measures or the level modification can be possible or not.

	SW (Switched)	AM (Advanced Monitored)	MA (Managed)
Usage measures	No	Yes	Yes
Set Level	Yes	No	Yes

2.2 Configuration (from the serial port of the ePDU)

The serial console of the ePDU allows the management of the EnergyWise agent. The REF3 document describes how to use the serial console.
The Communication Card minimal version software for EnergyWise support is version "12 Beta".

From a HyperTerminal connected to the serial Port, enter your password:

```
+=========================================================================+
¦                    EATON ePDU Configuration Utility                     ¦
+=========================================================================+

Enter Password: █
```

The root menu of the EATON ePDU Configuration Utility is displayed:

```
+=========================================================================+
¦                    EATON ePDU Configuration Utility                     ¦
+=========================================================================+
    1.  Network Management Card Settings
    2.  Factory Reset (Network Management Card only)
    3.  Restart Network Management Card
    4.  Firmware Upgrade Mode
    5.  Clear ePDU & System Log
    0.  Exit

Please enter your choice  => █
```

Select the menu 1 "Network Management Card Information".

```
+=========================================================================+
¦                    EATON ePDU Configuration Utility                     ¦
+=========================================================================+
    1.  Network Management Card Information
    2.  Network Settings
    3.  Trap Receivers
    4.  SNMPv1 Community
    5.  SNMPv3 USM Table
    6.  Date and Time
    7.  Email Notifications
    8.  Super User Name and Password
    9.  Multi-Users
   10.  EnergyWise Setting
    0.  Back to main menu

Please enter your choice  => █                                             :
```

And then the menu "10. EnergyWise Setting".

```
+=========================================================================+
¦                      EnergyWise Configuration Menu                      ¦
+=========================================================================+
    1.  Domain          : Eaton
    2.  Secret Control   : Enabled
    3.  Secret           : ******
    4.  Remote Port      : 43440
    5.  Listen Port      : 48296
    6.  Level            : 4
    7.  State            : Stopped
    0.  Return to previous menu

WARNING: Restart the Network Management Card to apply a new configuration

Please enter your choice  => █
```

From this menu, you can see and modify the ePDU EnergyWise configuration agent.

Enter the correct configurations
1. **Domain**: the EnergyWise name used in your network.

2. **Secret Control**: Enabled if you use a password to authenticate the communication between domain member and Endpoints.
3. **Secret**: the password used in the EnergyWise domain to communicate with the Endpoints (only used if you have enabled the Secret Control).
4. **Remote Port**: the remote port used by the domain members to communicate with the Endpoints.
5. **Listen Port:** the local port of the Endpoint to communicate with the domain members.
6. **Level**: the threshold level describe in the chapter 2.1.2.
7. **State**: the EnergyWise state agent of the ePDU (ref: chapter 4).

To apply a modification of these parameters, the agent must be restarted.

3 Entities Settings

For each entity, the following EnergyWise parameters are defined:
- Name
- Role
- Keyword
- Level
- DeviceType
- Importance
- EntityCat
- Unite
- Usage
- Binary Data
- Usage Vector

Depending if the entity is the master or an outlet, the parameter definitions can be different. The following paragraphs describe the parameters for each case.

3.1 Master Settings

3.1.1 Name

Definition

This parameter is used to address the endpoint from the EnergyWise domain. This parameter is a string (max length 31 characters).

Default value

The card hostname.

Set

Set enabled. This action sets another name than hostname for the EnergyWise Master name.

3.1.2 Role

Definition

This parameter is used to describe the master function. This parameter is a string (max length 31 characters).

Default value

"Power Distribution Unit"

Set

Set enabled.

3.1.3 Keyword

Definition

This parameter is used to describe the entity. It is used as filter from query. This parameter is a string (max length 31 characters).

Default value

"ePDU"

Set

Set enabled.

3.1.4 Level

Definition

This parameter represents the present level of the ePDU. It is an integer from 0 to 10.

Default value

10

Set

Set not allowed.

3.1.5 DeviceType

Definition

This parameter represents the Endpoint type. This parameter is a string (max length 63 characters).

Default value

The default value will be the commercial model name.

Set

Set not allowed.

3.1.6 Importance

Definition

This parameter represents the functional importance of the Endpoint in the customer infrastructure. The value is an integer from 1 to 100.

Default value

The default value will be 1.

Set

Set enabled.

3.1.7 EntityCat

Definition

This parameter represents the electrical equipment type:
- Producer, value: -1
- Meter, value: 0
- Consumer, value: 1

This parameter is an integer from the list: { -1,0,1}

Default value

The default value will be: Consumer, value: 1.

Set

Set not allowed.

3.1.8 Unit

Definition

This parameter represents the electrical power exponent unit from SI (International Systems of Units) used by the Endpoint when it sends power usage. It is a signed integer.

Default value

The default value will be: Consumer, value: 0 (Watt).

Set

Set not allowed.

Available

This parameter is only available for the Advanced Monitored and Managed ePDU device.

3.1.9 Usage

Definition

This parameter is the actual consumption of the card. **This data is not computed for the master.** The return value will be always 0.

Default value

0

Set

None

3.1.10 Usage Vector

Definition

This parameter is the maximum power usage value for each level. It is a vector of 11 unsigned values. As the usage of the device is not measured, this vector will be set to 0.

Default value

{ 0 , 0 , 0, 0, 0, 0, 0, 0, 0, 0, 0 }

Set

No.

3.1.11 Delta Usage Vector

Definition

This parameter is a vector of the difference between the actual power usage (parameter Usage) and the maximum power usage for each level. It is a vector of 11 signed values. As the usage is not measured for the master, this vector will be set to 0.

Default value

{ 0 , 0 , 0, 0, 0, 0, 0, 0, 0, 0, 0 }

Set

None

3.1.12 Binary Data

No binary data

3.2 Outlets Settings

3.2.1 Name

Definition

This parameter is used to address the endpoint from the EnergyWise domain. This parameter is a string (max length 31 characters).

Default value

The name of the outlet.

Set

Set enabled. This action sets another name that outlet name fixed by the ePDU.

3.2.2 Role

Definition

This parameter is used to describe the function of the outlet. This parameter is a string (max length 31 characters).

Default value

"Outlet"

Set

Set enabled.

3.2.3 Keyword

Definition

This parameter is used to describe the entity. It is used as filter from query. This parameter is a string (max length 31 characters).

Default value

No default value.

Set

Set enabled.

3.2.4 Level

Definition

This parameter represents the current level of the outlet. It is an integer from 0 to 10.

Default value

None. If the outlet is on, the level will be 10; else (off) the level will be 0.

Set

Set enabled.

3.2.5 DeviceType

Definition

This parameter represents the Endpoint type. This parameter is a string (max length 127 characters).

Default value

<Device type of the master> Outlet

Set
Set not allowed.

3.2.6 Importance

Definition
This parameter represents the Endpoint functional importance in the customer infrastructure. The value is an integer from 1 to 100.

Default value
The default value will be 1.

Set
Set enabled.

3.2.7 EntityCat

Definition
This parameter represents the electrical equipment type:
- Producer, value: -1
- Meter, value: 0
- Consumer, value: 1

This parameter is an integer from the list: { -1,0,1}

Default value
The default value will be: Meter, value: 0.

Set
Set not allowed.

3.2.8 Unit

Definition
This parameter represents the electrical power exponent unit from SI used by the Endpoint when it sends power usage. It is a signed integer.

Default value
The default value will be: Consumer, value: 0 (Watt).

Set
Set not allowed.

3.2.9 Usage

Definition
This parameter is the actual consumption of the outlet.

Default value
None, the actual consumption will be returned.

Set
None: dynamic measure value.

3.2.10 Usage Vector

Definition

This parameter is the power usage maximum value for each level. It is a vector of 11 unsigned values. The maximum power will be computed from the rated current capacity of the outlet and the PDU rating voltage. If the values are not measured by the ePDU, the value will be 0.

Default value

If the rated current capacity of the outlet and the PDU rating voltage are measured by the ePDU:
{ 0, 0, 0, 0, 0, Max Power, Max Power, Max Power, Max Power, Max Power, Max Power}
If the rated current capacity of the outlet and the PDU rating voltage are **not** measured by the ePDU:
{ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0}

Set

None.

3.2.11 Delta Usage Vector

Definition

This parameter is a vector of the difference between the actual power usage (parameter Usage) and the maximum power usage for each level. It is a vector of 11 signed values.
The delta vector is used to represent the change in power consumption that would happen when moved to the given power level.

Default value

None: dynamic measure value.

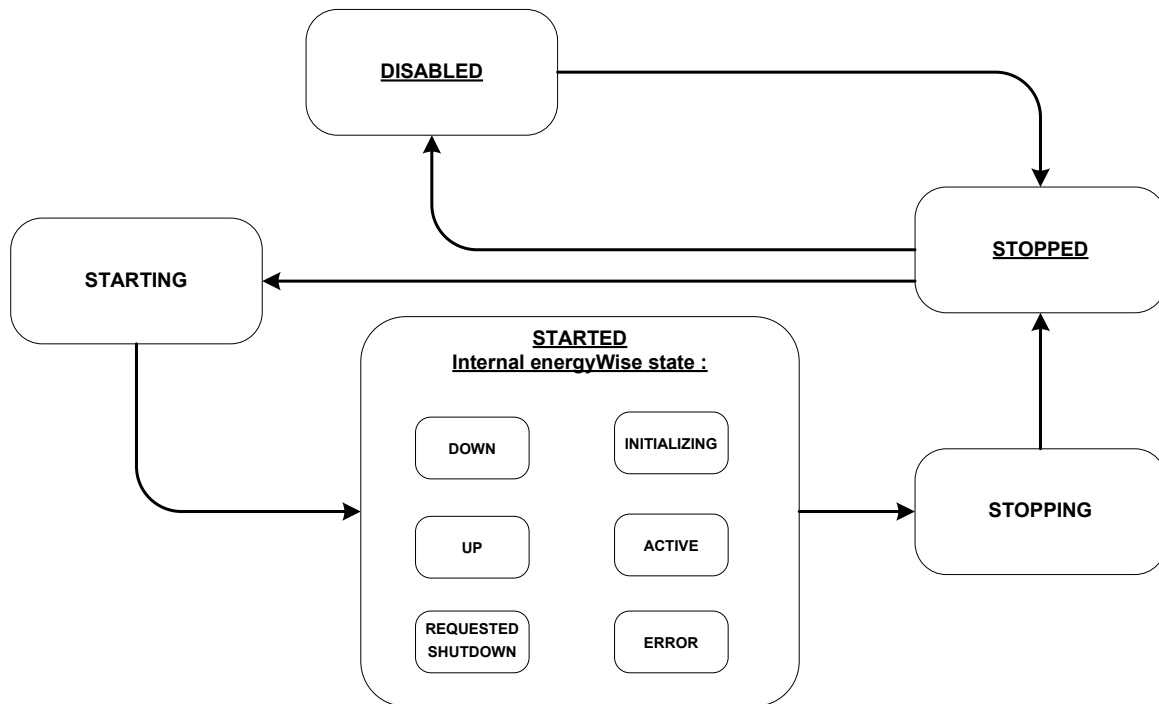| Set |
| --- |

None.

4 Life cycle of EnergyWise Agent

The different states of the ePDU EnergyWise Agent is represented by the following schematic:

This state is saved in flash and restored during the boot according to following rule:
If the value restored from flash during the boot is different from Disabled, the agent tries automatically to reach the Active state; else, the agent stays disabled.

The underlined states (Disabled, Stopped) are terminal states, the other states are transition states.
The definition of the "Started" sub states is the following one:
- Down : Engine is not running, either not started or shutdown
- Initializing: Engine is starting up
- Up: Engine is up and advertising, but has not received an ACK
- Active: Engine is up and advertising and has been acknowledged with ACK
- Requested Shutdown: Engine will shut down at next discovery interval

From HyperTerminal, the user can see the agent actual state and can manage it with the following command:
- Disable: the agent is stopped and its state takes the Disabled value.
- Enable: If Disabled, its state takes the Stopped value.
- Start: the agent starts and tries to reach the Active state. During "activing" period, the state is Up.
- Stop: the agent is stopped and its state takes the Stopped value.
- Restart: the agent restarts (or start if not running).The agent tries to reach the Active state.

The commands allowed from initial state are summarized in this table (red: command not allowed, green: command allowed):

cmd	Initial state					Finale State
	Disabled	Stopped	Stopping	Starting	Started	
Disable	🟥	🟩	🟩	🟩	🟩	Disabled
Enable	🟩	🟥	🟥	🟥	🟥	Stopped
Start	🟥	🟩	🟩	🟥	🟥	Started
Stop	🟥	🟥	🟥	🟩	🟩	Stopped
Restart	🟥	🟩	🟩	🟩	🟩	Started